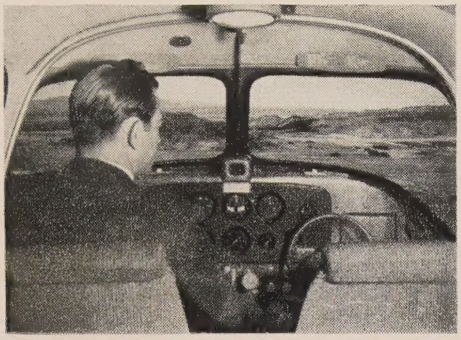
SKYWAYS

MILITARY ★ CIVIL ★ COMMERCIAL AVIATION

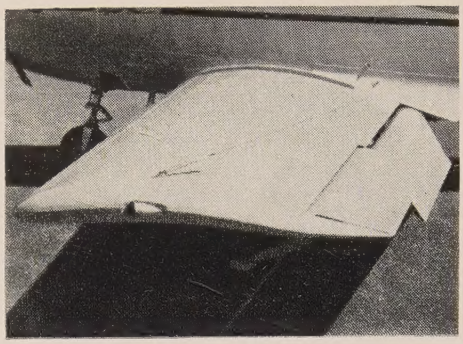
NOV. 1948 25¢

Special Section: USAF Review ☆ Pilot's Report: Bonanza

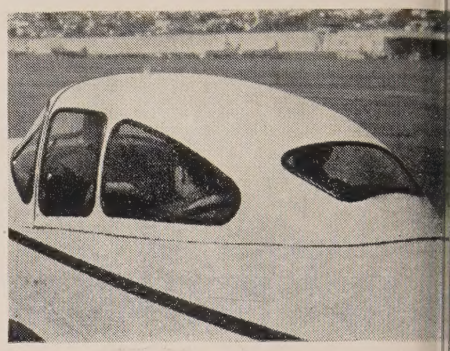
CHECK THESE NAVION FEATURES



1 SELECTIVE TWO-CONTROL gives automatic coordination. Patented inter-connected aileron and rudder control permits steering with wheel alone. But you have rudder when you want it. *Navion* flying is easier, safer...pleasantly relaxing.

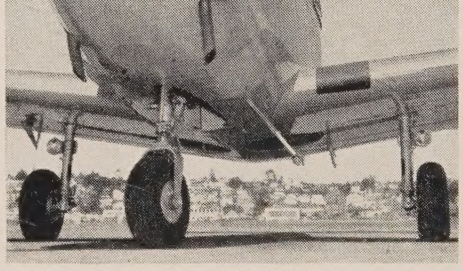


2 HIGH-LIFT FLAPS. Large, slotted, full-deflection flaps give the *Navion* slowest, shortest landings of any plane in its class. Roll only 335 feet. Stall-resistant wing gives full aileron control for maximum safety in slow flight and landings.

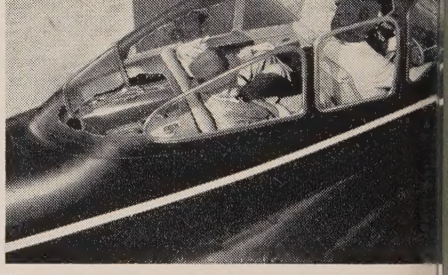


3 FULL-VISION CABIN. Here's visibility designe for Sunday traffic. Seven large, clear windo let you see in every direction. No blind spo while flying or taxiing. You can even use a re view mirror . . . see 12° down over *Navion* no

4 THICK-SKINNED RUGGEDNESS. The all-metal *Navion* takes heavy duty assignments in stride. Sturdy construction and thick-skinned wings, fuselage and tail assure safety and low maintenance cost. For permanent beauty, durable enamel finishes now standard...choice of 4 striking colors.



5 LARGE, STEERABLE NOSEWHEEL. Easiest, safest ground handling under all conditions. *Navion's* over-size tires, sturdy tricycle landing gear, wide wheel tread and high speed ground clearance make rough fields and cross-wind landings a cinch. Extra powerful, equalized hydraulic brakes.



6 ROOMIEST CABIN. Quiet . . . well-ventila ...smartly styled. Elbow and leg room to sp for all four passengers. Adjustable front s *Navion* cabin, 42″ wide; 94″ long; 52″ high. C opy rolls open 2½ feet for more convenient trance and exit. Baggage space up to 180 pou

7 FLEXIBILITY OF PERFORMANCE. 150 mph. cruising speed. 750 mile range with optional reserve tank. Easiest air ride. No tail wagging, even in rough air. No other plane offers such intelligently chosen and well engineered combination of features. For illustrated booklet, demonstration or free business trip, write us today, on your business letterhead!

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The Birdmen's Perch

By *Major Al Williams*, ALIAS, "TATTERED WING TIPS,"
Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.

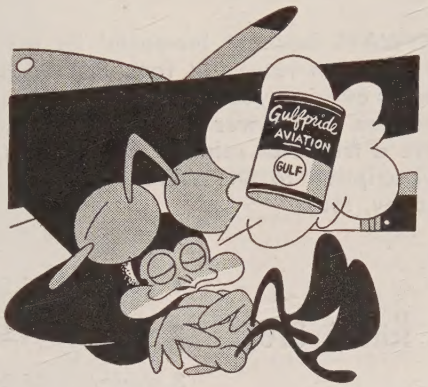
We're going to start off the reactivated Little Known Facts About Well Known Planes Dept. with a bang.

We had so much help (by mail) from so many people when we were questioning whether to continue the "Facts Dept." that we figgered we owed you all a vote of thanks.

So we're sending some token Perch Pilot Commissions (bottom rung, naturally) to a fistful of names that we've pulled out of our mail bag. If you missed out on one of these "gift" commissions, remember that you can still *earn* one by sending in a Little Known Fact that's unusual enough to print.

Welcome to our select little group, Edward Watson, Cedarcrest Farms, Independence, Mo. And welcome to Sabra Baker, Cornell Pilot's Club, Ithaca, N.Y. And to Elbert Schory, Supervising Pilot, Ohio Forest Fire Patrol, and Dr. Verne F. Gouger, 5352a Devonshire, St. Louis, Mo., and Sgt. Don Edmonston, AF 16226013, Sqdn. K-2, Scott Air Force Base, Belleville, Ill.

Just watch how business improves, now that you're a Perch Pilot (br), John Isaacs, manager of Isaacs Field in Stanley, Wis.!



Like we said, these comissions are free for you six people—a gesture of good will, you might say. But if any one of you can get to sleep tonight without sitting down and writing up a few Little Known Facts for us, we'll be horrified, scandalized, and disappointed!

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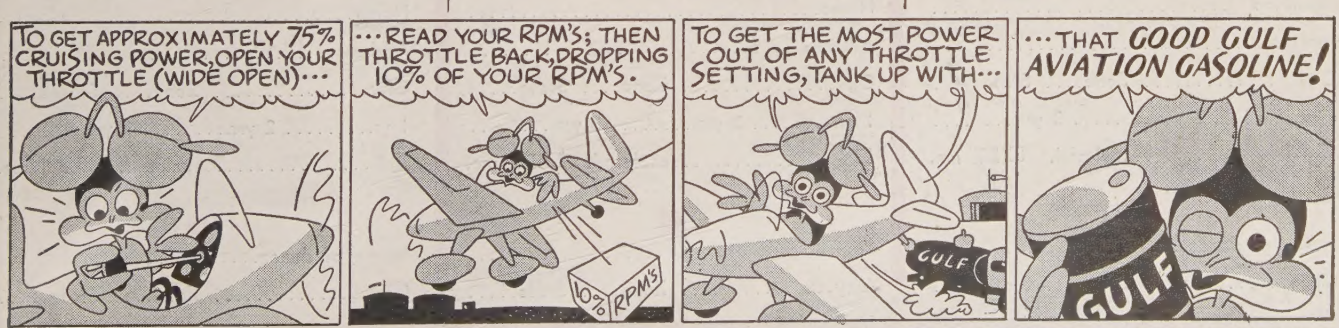
Remember, too, that we're inviting *all* dealers and operators to carry Gulfpride Aviation—Series D—so if yours does not have it yet, remind him that he can save money on spare parts and overhauls with this sensational new Gulf Oil!

NOTE: We're still getting acquainted with our new F-8 Gulfhawk. We'll try to let you know more about her next month. We can tell you now that she's got a lotta muscle!



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SKYWAYS

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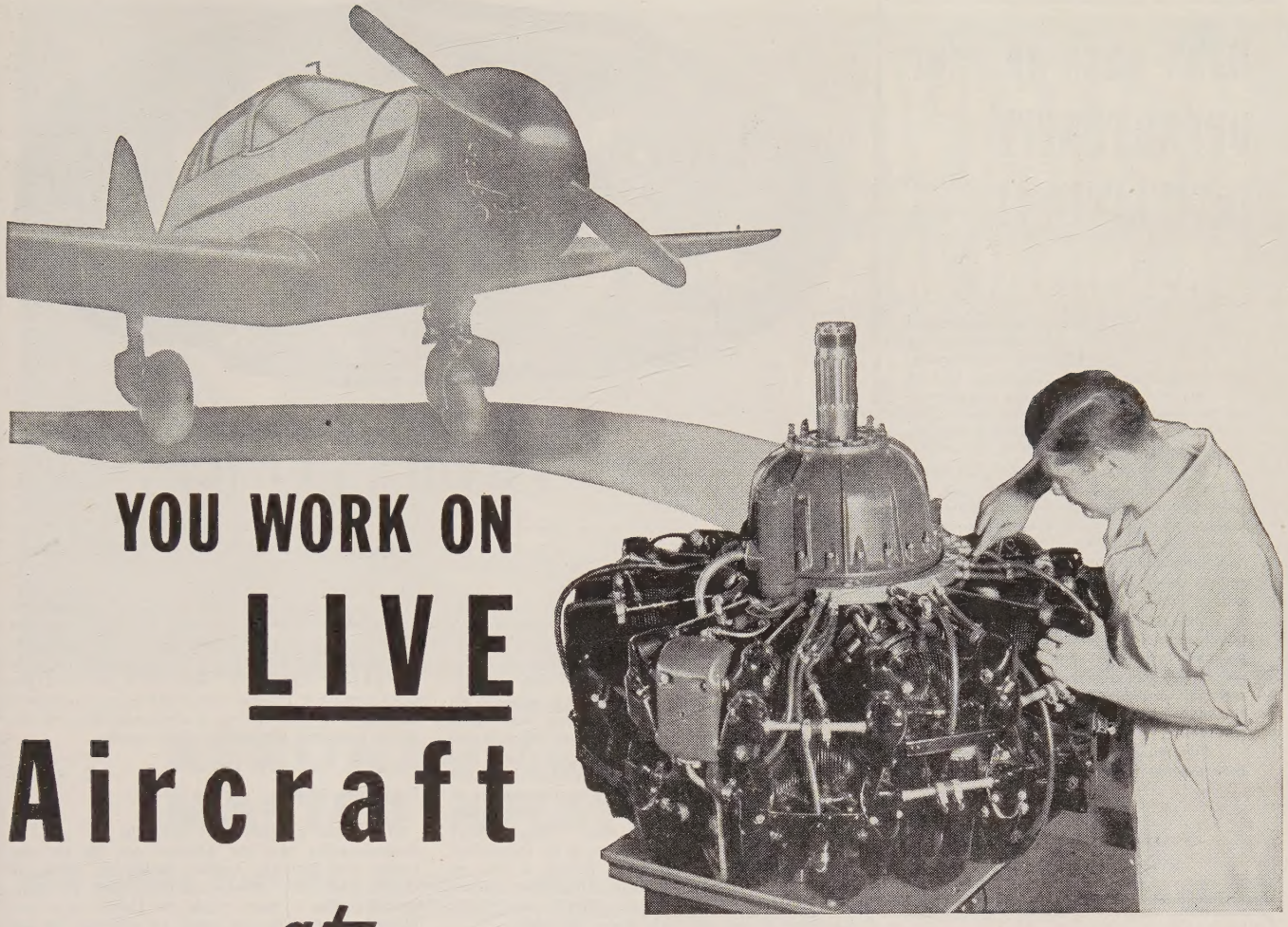

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AIR YOUR VIEWS

Attn. Manufacturers

Gentlemen:

Like many of my fellow pilots, I, too would like to see a low-priced plane on the market . . . one that would be within easy reach of the majority. At present, the plane manufacturers are not selling many ships because the average pilot can't afford their exorbitant prices. All the fellows I know are not buying new ships because they're waiting for that "right priced plane." In the meantime, however, they are joining clubs and busying, cooperatively, used Cessnas, Pipers and Aeroncas. The price most of the pilots today are ready to put out for a plane is $1500 or $1700 at the most. These fellows want a new plane . . . one all to themselves and a two-placer. Naturally, there's a girl on the horizon and there's many a romantic place a pilot could fly to. BUT . . . they'll never have romance in the air with prices sky-high!

VINCE WILLIAMS
MBS, San Francisco, Calif.

•

Gentlemen:

C. B. Colby sure hit the nail on the head in "Short on HP — Long on Fun."

I have a private license, but only get to fly about half an hour a month . . . when I'm lucky. The $8 per hour rental gets me. All I can do is hang around the airport and dream of flying. I make very little money on my job, but I feel that I could fly an hour a week if it only cost $3 or $4 an hour. The small lightplanes that Colby wrote about . . . or new designs along that line . . . would help us fellows a lot.

J. F. GLASSCOCK
Tucson, Arizona.

And still the letters come in from pilots and air enthusiasts all over the country, each one adding his "Amen" to the really inexpensive lightplane idea. Bright hope in the direction of getting a lightplane such as Colby suggested is the recent word from Al Mooney that his single-seater has been certified by CAA and he expects to go into production. Ship will cost $1,600.—ED.

•

Spartan Info.

Gentlemen:

Some time ago you ran an article that told about the Spartan School of Aeronautics and a fellow who went there. Can you tell me what issue that was in and whether or not I can get a copy of it?

KEITH H. KROLL
Lorain, Ohio

Congratulations on an excellent memory. That article was a part of the August, 1946 issue, and you may order a back copy if you wish. Address your request to Circulation Dept., Skyways, 444 Madison Ave., New York 22, N. Y. Okay?—ED.

In Trouble?

Gentlemen:

In your September issue you had a picture of a Mallard flying on one engine. The caption read " . . . but don't dare pedestrian's judgment by flying low like this . . . " If you'll look at the picture again, I'm sure you'll see that the pilot is having trouble and making an emergency landing . . . or giving a demonstration of the ship's handling qualities on one engine.

ED. SILAR
Nashville, Tenn.

Right the second time. Actually the pilot is demonstrating how the Mallard can fly on one engine and how she handles in landing with one engine out. The photo was not used to demonstrate why a flyer might be flying at a low altitude, but rather to show an example of low flying. In this case, the Mallard could well be flying above the prescribed minimums, but that does not alter the fact that some pedestrian could claim it was below minimums. The only point we wanted to bring out was not to tempt the misjudgment of pedestrians.—ED.

•

Hm . . . !

Gentlemen:

I liked your feature "Forsgate for Flyers," by William A. Price, but I'd like to point out that Mr. Price stated the stacked rows of wheat bundles were beautiful. According to the aerial view of the field, the wheat has been combined. How 'bout it?

KEITH EVERETT
Galva, Illinois

Arthur Price is a newspaper reporter by profession. Next time we see him we'll ask what his farm background is.—ED.

•

"Lost" Copilot

Gentlemen:

Some months ago, in the February issue to be exact (page 22) you ran a picture of a B-29 and crew. Could you send me the names and last known addresses of the men in that picture? The man standing on the far left looks like my old copilot, FO David Goldstein. Our crew broke up shortly after the war ended and I've lost contact with most of them. I rode the tail on a B-29.

SGT. CLARENCE K. BLEKKERK
12239740
611th A.C. & W. Sq. Bks. No. 3
APO No. 181 c/o PM
San Francisco, Calif.

Wish we could help, Sarg., but unfortunately the caption on the original picture does not give the names of the crewmen. Perhaps some reader knows your copilot and will let you know his address.—ED.

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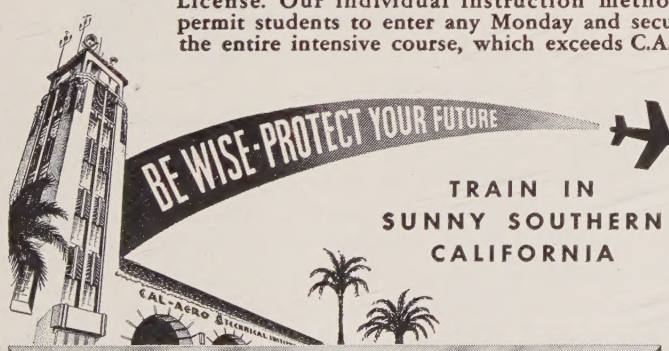

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S-11

USAF NEWS

BEFORE 30 June 1949, the Air Force will accept 10,000 Air Reserve and Air National Guard officers who are qualified in certain non-rated specialties for three-year tours of active duty. The United States Air Force will also accept applications from qualified civilians for direct commissions in the reserve who may, upon acceptance, be called to active duty. *(See below.)*

Rated officers are not required at this time unless they have had extensive experience in professional, technical, or administrative fields as well.

Here are the fields in which officers are needed: electronics, procurement, production, intelligence (especially photo interpreters), inspection, air installations, radar navigation, public information, chemistry, weather, finance, law, photography, personnel, and aeronautical engineering.

Application should be made on WD AGO Form 125, available at any Air Force recruiting station or air base.

DIRECT commissions in the Air Reserve are available to civilians qualified by experience in the fields of production inspection, photo equipment, aircraft inspection, airborne signal equipment, ground safety, weather, or aircraft design and development.

This offer, authorized in a new USAF regulation 45-15, is designed to create a source of personnel proficient in civilian specialties immediately adaptable to use by the Air Force. Applicants will be appointed in grades commensurate with their experience and qualifications, and will not be called to active duty without their consent except in the event of mobilization.

Air Force reserve officers may be appointed in a higher grade if they meet qualifications. Applications should be made on WD AGO Form 170 and submitted in triplicate to the numbered Air Force covering the applicant's home area.

PROPER coordination of air and ground troops in a combat assault has been demonstrated for the past six weeks at Eglin Air Force Base, Florida, to student officers of various schools in all branches of the armed services.

Operation Combine III, as the exercise was designated, has been conducted by Maj. Gen. William D. Old of the Tactical Air Command, utilizing 8,000 Army, Navy, Marine, and Air Force personnel. Senior Navy representative is Rear Admiral John W. Reeves, Jr., chief of training at Pensacola Naval Air Station.

The demonstration began September 27 and is to run through November 3, with three-day exercises scheduled each week.

Among the 500 planes participating were Navy and Marine F4U's, F4U5's, F6F's, F7F's, and AD1's, and Air Force C-82 and C-47 transports, B-29 and B-26 (formerly A-26) bombers, and F-84's, F-82's, F-80's, F-51's, and F-47's.

REGROWTH of the Air Force has not affected a worth-while activity that at first glance seems to be traveling in the opposite direction—the Air Force's program of donating surplus equipment to schools and colleges.

In its plan of completely replacing each airplane every fifth year, the Air Force will continue to have surplus equipment. Its tremendous disposal program after the war proved that more value accrued from giving away surplus equipment to schools than from selling it.

Post-war donations have totaled roughly half a billion dollars, and currently are exceeding a million dollars a month.

The public and the Air Force derive several benefits from the program. Students acquire at least the rudiments of technical skills valuable in the event they are inducted. (Some became so interested they enlisted to pursue technical careers.) Equipment is donated on condition that it will be available for recall in an emergency and that the Air Force will have access to results of research performed on donated equipment.

To get equipment, schools need only submit a request for material they can use to their State's department of education. The state sends requisitions to Air Materiel Command, Wright-Patterson Air Force Base, Ohio. U. S. Office of Education representatives check requested items against surplus property lists and authorize AMC to ship selected equipment.

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Constant Hosiery Stores are scattered throughout the Middle West. President H. E. Constant stays in touch by Bonanza, makes it home to Milwaukee for dinner, too! "Our Bonanza operates 12 months a year," he states. "It's invaluable to rush promotional material and merchandise right from our mill."

"We deal in 'out-size' products, such as trailerized truck tanks," says J. K. Downer of Scientific Brake and Equipment Company, Saginaw, Mich., "and our sample case would fill freight cars. We pick up distant customers with our four-place Bonanza, bring them over for plant inspection and return them in hours. Sales are easier to make. We get to know our customers better, too." All this at the Bonanza's amazingly low operating cost—measured in pennies per mile.

"One of our agricultural machinery customers was combining wheat in Texas when he needed parts—fast," reports A. A. Dryden, president of Oberlin Motor Company, Oberlin, Kansas. "He was 520 miles away, but our four-place Bonanza got parts there three hours after his call. When we give service like this we *keep* our customers, even though other distributors are nearer. Our Bonanza is a real sales tool!"

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NAVAL AVIATION

ONE of the most lethal weapons developed for aircraft-carrier operations is the Navy's new attack plane the North American XAJ-1. Heavier than the twin-engine planes now operating off carriers it is lighter than the P2V *Neptune* which has made test flights from the carrier USS Coral Sea. The XAJ-1 has tricycle landing gear, a high wing, a pressurized cockpit for its crew of three, and four-bladed props automatically sychronized to relieve the pilot of constant adjustment of propeller controls. Powered by two conventional Pratt and Whitney reciprocating engines under the wings and one GE-Allison turbo-jet in the fuselage it goes faster and carries a heavier bomb load than present carrier types.

IT is getting more and more difficult to get lost at sea these days. The Navy has developed another new safety technique called SOFAR—sound fixing and ranging. A downed pilot riding his rubber raft with confidence, throws a bottle-cap sized bomb over the side. After it has reached a certain depth it detonates. The succeeding explosion sends out underwater signals which are picked up by three monitoring stations. By simple triangulation, the source of the sound is determined and rescuers are immediately dispatched to the area. Soon SOFAR will be the rescue by-word of air-sea voyages all over the world.

THE 92-ton Lockheed transport *Constitution* has taken its place as the biggest guinea pig ever to serve naval aviation. The 180-passenger two-deck sky giant while serving in its primary mission of air transport will also be a laboratory. What is learned in its actual use will be applied in the further development of aircraft of this design and in the evolution of its successors. At its maximum gross weight of 92 tons, it will take off in a short 2,350 feet, clear a 50-foot obstacle in 4,320 feet, and land over a 50-foot obstacle and stop in 2,311 feet. In spite of its size, it can operate from any airport used by commercial aircraft. Its maximum range is 6,300 miles, ceiling 27,600 feet, top speed 303 mph, stalling speed 80 mph. Within the 189-foot wing span it houses 10,000 gallons of gasoline, four Pratt and Whitney *Wasp Major* engines, and man-sized tunnels which permit inspection and adjustment of engines, landing gears, wheels and brake mechanisms while the plane is airborne. Its tail towers 50 feet above the ground, and the horizontal tail area is 3.5 times the total wing area of the F-80 jet fighter plane. There are 59 windows, 8 doors, and 13 emergency exits. The kitchen is equipped with a 6 cu. ft. electric refrigerator, a large electric range, two hot plates, a griddle, and sink with hot and cold running water. Three hundred hot meals per flight can be served. The electrical system, supplied by four 15-kilowatt generators, would be sufficient to furnish electricity at peak use for 20 average homes.

A MINIATURE telemetering system weighing only a few pounds and capable of continuously transmitting 24 different kinds of scientific information from a rocket roaring through space at nearly 3,000 mph has been successfully flight tested by the Navy at its White Sands Proving Ground, Las Cruces, New Mexico.

NOVEMBER is anniversary month for many important firsts in Naval Aviation. The first "long-distance" flight was made on November 18, 1911. Naval aviators number one and three, Lieutenants Ellyson and Towers flew a Curtiss seaplane 146 miles from Annapolis to Old Point Comfort in 2 hours 27 minutes. The same Lieut. Ellyson on Nov. 12, 1912, in a Curtiss hydro-aeroplane AH-3 made the first successful catapult launching at the Washington Navy Yard. The catapult gave an end speed of 35.6 mph. Pensacola was officially designated a Naval Aeronautical Station Nov. 16, 1914. Four years after the first successful launching of an aircraft from a land-based catapult came the first successful catapult launching from a vessel under way. On Nov. 6, 1915, an aircraft piloted by Comdr. H. C. Mustin was catapulted from the *U.S.S. North Carolina* in Pensacola Bay.

PROP WASH

Aero Oddities

First Flighter. Pilot Frank Love recently gave his friend, Mrs. Arden Sherwood, her first ride in an airplane. After taking off from air strip on his farm and climbing to altitude, Pilot Love made a steep turn, a mild wing-over, then quickly came in for a landing. Asked why he'd cut the ride so short, Pilot Love exclaimed, "She wanted me to do a loop . . . and I've only had my private license a year." Pilot Love was 70, his passenger, 80. *(R. Nelson, Kansas City, Mo.)*

Bail Out. When a California sheriff learned one of his youthful prisoners was a student pilot who would be washed out of course if his training was interrupted, the sheriff came to rescue. Each morning, sheriff takes prisoner to airport, lets student pilot get in his time while the sheriff, also a pilot, flies wing . . . just to make sure. *(F. A. Wall, San Francisco, California)*

Sky Bus. Deborah Conklin, 11-year-old North Bend, Oregon, girl, journeys 120 miles by commercial airliner each day to attend special classes in Eugene. Her father estimates the daily airliner fare is less costly than boarding the young lady in Eugene would be. *(Philip H. Bailey, Los Angeles, California)*

Navy Query. The Navy is still busy wondering why, after wings of an SB2C folded 4,000 feet in the air, the operating manual was found lying open at the page describing operation of the wing-folding mechanism. *(A. H. Knouff, Tucson, Arizona)*

Special Delivery. A farmer living next to small airport had an important message for friend who lived several miles down the valley. Not wanting to take time to drive down and friend not having a phone, farmer hired a plane, flew down, dropped message, and was back home in few minutes. *(G. Burmeister, Glendale, Calif.)*

Parrot Pursuit. Farmer in southern part of Chile was tired of having mountain parrots fly in by thousands to dine on his newly sprouting wheat. Farmer bought a *Cub*, learned to fly, and now uses it to chase parrots off. As result he's lost practically no grain to the birds. *(E. M. Blackburn, Quino, Chile, S. A.)*

Expensive Coffee. Pilot Bates landed his plane on Nebraska highway, taxied into town, parked plane in front of cafe and went in for cup of coffee. When he came out, State Police handed him ticket and $10 fine. *(C. C. Donovan, Victoria, Texas)*

Instruction Obstruction. Honolulu airport manager Bill Holloway looked out of office window and noted obstruction on Runway 4. Scooting down to end of runway, Holloway found a man teaching his wife to drive "where no automobiles could confuse her!" *(Wm. P. Kraus, Waialua, Hawaii)*

Motion Accepted. Farmer Ailiff Neel casually invited fellow flying farmers to "fly up and see us sometime." Next day 24 small planes came in for a visit. Mrs. Neel arose to the occasion and whipped up breakfast for over 30 guests. *(E. E. Gentry, Marthaville, Louisiana)*

Att'n Readers:

If you have any news note oddities pertaining to aviation, send them to SKYWAYS, Box 17, 444 Madison Avenue, New York 22, N. Y. Five dollars will be paid the sender of each "oddity" printed. Contributions cannot be returned unless accompanied by stamped addressed envelope. The decision of the editors is final.

FLYING GOVERNOR

Only Pilot-Governor in U. S. is Michigan's Governor Sigler

By H. R. GERACE

Aviation Editor, Flint Journal

GOV. SIGLER, noted as one of the best-dressed governors in the U. S., shuns wearing so-called special flying suits

MORE than two decades ago, Gov. Kim Sigler, Michigan's flying chief executive, got paid off in flying lessons for winning a lawsuit.

That unusual fee for the young practicing attorney, after lying dormant for nearly 20 years, finally blossomed into an eager and participating interest in flying.

Today Gov. Sigler is a familiar figure at nearly every Michigan airport and is well-known at many others across the country. His own private plane, a Beechcraft *Bonanza* bearing the State Seal as an insignia, which he pilots himself, is known up and down the length of Michigan.

FLYING his own plane, Gov. Sigler is able to visit all parts of the State with frequency otherwise impossible

The flying governor was an attorney in Hastings, Michigan, back in the days when Charles A. Lindbergh succeeded in his epoch-making trans-Atlantic solo flight. He agreed to represent a chap he can only remember as Getman in a lawsuit involving a breach of warranty on a Waco 10.

Circuit Judge Charles White heard the case in Berrien County. Barrister Sigler, displaying the same shrewdness which later won him fame as a grand jury prosecutor, centered his argument around the historic Lindbergh flight.

He won full damages for his grateful client who insisted on teaching him how to pilot an airplane.

It is interesting to note that Gov. Sigler's opponent in the lawsuit was Stuart White, the governor's appointee as chairman of the Michigan Public Service Commission.

Although Getman succeeded in teaching him the rudiments of flying, Gov. Sigler remained without much enthusiasm for piloting a plane. Of course he flew as a passenger in private and

PRESS CONFERENCES and other gubernatorial duties don't give Gov. Sigler much free time, but his keen interest in aviation is very quickly leading the air-minded State of Michigan to a Number One position on the air age map

commercial planes whenever this mode of travel was convenient, but he never pursued his instruction enough to obtain his pilot's license.

Finally, however, 1946 rolled around. After winning laurels as special grand jury prosecutor investigating graft in the State government, Sigler was the people's choice as Republican candidate for governor.

Despite the popularity he had gained as the colorful grand jury prosecutor, there still remained a vast amount of campaigning to be done, as the Democrats had been in power for many years. And Michigan is a big state. Its 58,000 square miles are separated into an upper and a lower peninsula by the Great Lakes. Much of the upper portion and a good section of the top of the lower are forestland. Consequently, political campaigners have given citizens in the northern parts a "poor relation" treatment.

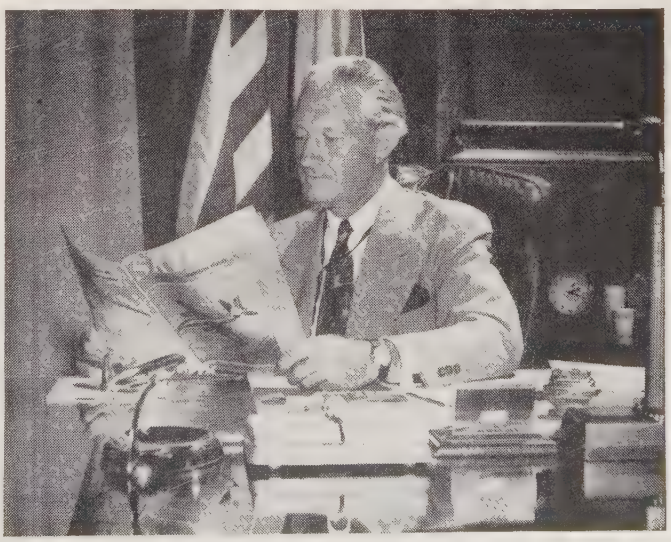
The region is a marvelous vacation land, but its vast and populated areas are widely scattered. No airlines operated scheduled flights there.

At any rate, Sigler was giving a campaign speech in Plymouth, Michigan, the bailiwick of Col. Cass A. Hough, the flyer who was Maj. Gen. James A. Doolittle's righthand man during the war. The colonel and the candidate got together and Col. Hough volunteered to fly Sigler anywhere in the State. Sigler, aware of the value of an Upper Peninsular campaign, said he would like to plan a series of talks there.

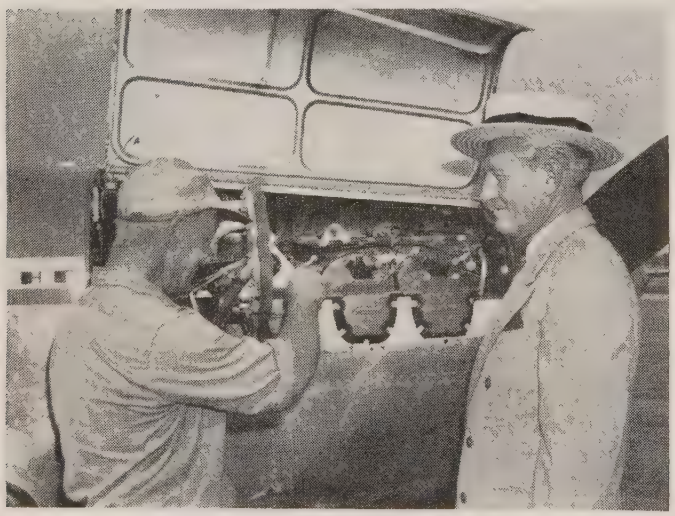
A short time later Col. Hough and Sigler were enroute in the former's twin-engine Cessna.

Proud of his State and of the man he believed would be its chief, Col. Hough was determined that its governor should be a man of distinctive talent. He considered piloting ability among

AVIATION NEWS requires keeping up with, and at his desk in Lansing State Capitol, Gov. Sigler notes the latest



PILOTS will recognize the familiar "okay" sign Gov. Sigler gives here after his check-out flight in the Bonanza



MECHANIC in charge of Governor's Bonanza is Dwaine Cotter. The Governor pays all expenses out of his own pocket

these talents and for the second time in his life Sigler found himself receiving flying lessons.

Many other prominent Army and Navy flyers gave Sigler flying lessons, and finally in April of 1946 he was awarded his private pilot's license.

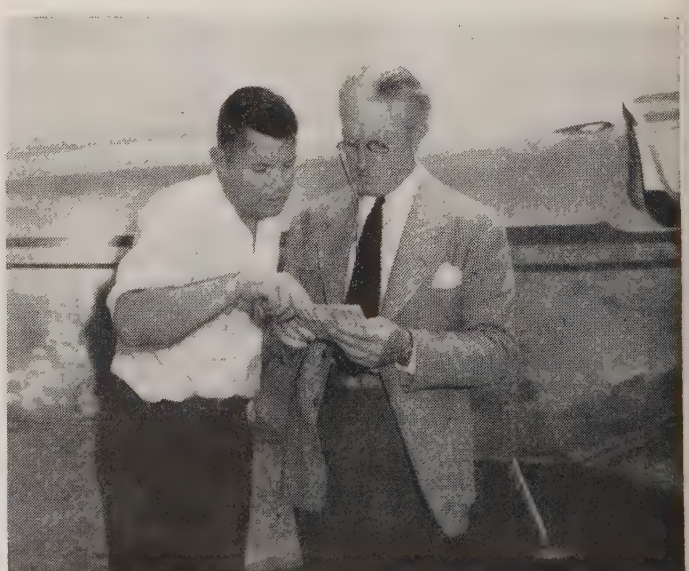
In November of the same year, after stumping the State by plane, he was elected governor.

His election really clinched his estimate of the value of flying. He began to realize the rigors of his duties as the elected leader of Michigan's five million residents. Demands upon his time were many and the peculiar geography of the State makes travel awkward.

By July, Gov. Sigler invested $10,000 in his own aircraft. Now he was unfettered and was living proof that flying wasn't just for the youthful. In 1946, when *(Continued on page 41)*

SKY ROOM, overlooking Lansing's Municipal Airport, is favorite luncheon spot for the Governor and his guests

BONANZA was delivered to Gov. Sigler in July, 1947. Here he looks over check list with Beech's Bob Prince



AERIAL JAUNTS with guest passengers occur frequently. Here Mayor Viall of Flint, Mich., welcomes Gov. Sigler and radio's Ted Malone (center) to Flint Municipal Airport. Another time a guest was Rumania's ex-King Michael

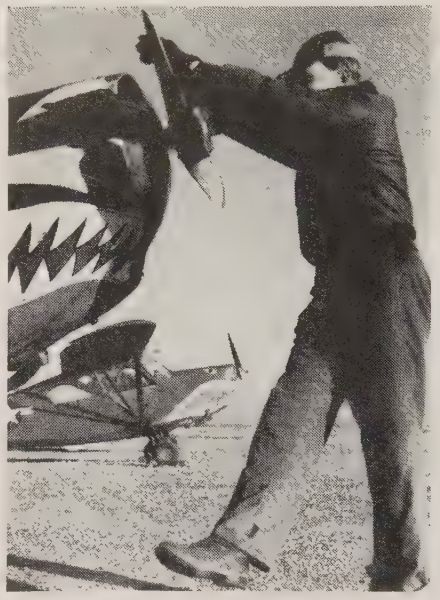
STATE POLICE of Michigan also use a Bonanza. Pilot of police plane is Barney Froberg, shown here discussing plane operations with his boss. Gov. Sigler was 52 when he got his license in 1946, now has 1,200 flying hours

Bush Flyers of the 5th

Headquarters, Fifth Air Force, Nagoya, Japan

"HOLD it up a minute, fellows. Now that you have the dope on the weather, I have a few flight changes. Thomas, you have to make a stop at Field Three. They have a magneto that Hendricks Field needs for a grounded cargo ship. On your way back land at Kerry and pick up a passenger."

Remarks such as these may be overheard any morning in the briefing room of the 158th Liaison Squadron, a Fifth Air Force organization, which is located near Nagoya.



NAGOYA, JAPAN—S/Sgt. Dick Weta of 158th Liaison Squad., props his toothy L-5

The Briefing Sergeant might continue, "Flags, there is an aerial mail pick-up at Excelsior and for the lov-o-mike don't let those bamboo uprights get tangled up in your tail assembly.

"Longfield, you have to go to Hill camp . . . It's a stretcher case. Some kid is in a bad way and they want to get him to the hospital right away. Take it easy because the weather there is rotten. They say they'll talk you in if it's necessary, but watch those crosswinds in the canyon. I'll have Charley take your regular run.

"Now, for tomorrow, we have it pretty light. So far, the Military Government wants some rice collection pamphlets dropped over Aichi Prefecture and the Medics seem to think Area Three should be sprayed with DDT again. That's about all, guys . . . good luck."

Every day, this organization dispatches its tiny L-5 aircraft to points east, west, north and south throughout Japan. Rising from smooth concrete runways, racetracks, bumpy and soggy meadows or heavy beach sand, the tiny, fragile, fabric-covered L-5's take to the air each day.

The "bush" pilots of the Fifth Air Force go quietly about their business of flying. Missions of mercy, routine passenger-freight runs, or on some special assignment, these flights go through

MOTTO of the 158th Liaison Squadron of 5th Air Force in Japan might well be "door-to-door delivery." Here one of squadron's L-5's comes in for a street landing in Nagoya to deliver patient at the door of hospital

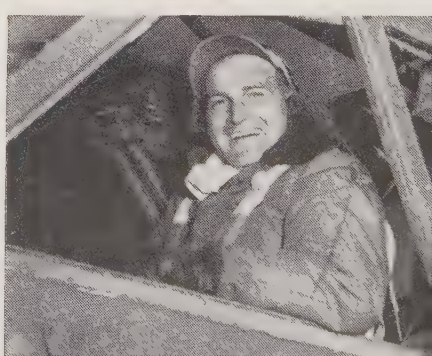
ORDERLIES of the 395th station hospital in Nagoya lose no time in getting patient out of plane and into hospital. Within a few minutes after the man, a 5th Air Force officer, broke his leg, he was enroute to station hospital

with regularity that's typical of the U. S. mail.

During the war, liaison squadrons attached to the various branches of the armed forces attracted much attention for they were the men who skimmed close to the ground near or behind enemy lines. Armed with nothing more than tommy guns or a *(Continued on page 45)*

CO of the 158th Liaison Squadron of 5th Air Force is affable Capt. Ben Walters. His base is Komaki Airdrome in Nagoya. Typical of outfit's able pilots are S/Sgt John Bella (below right) and M/Sgt S. Morris (bottom right). Bella is based with B flight at Johnson Base, Morris is at Itazuka

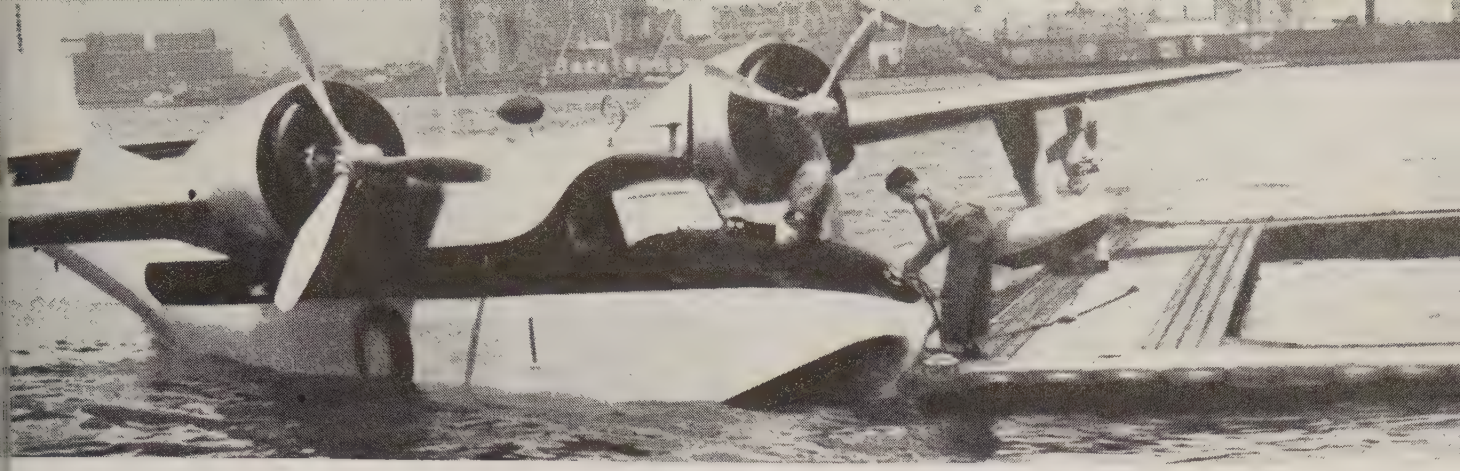
CELEBRATIONS break the monotony and so the liaison squadron celebrates any and every thing. This banquet is for nothing at all, but CO Capt. Walters cuts the cake anyway



GRUMMAN MALLARD, a 10-passenger amphibian, has been the choice of many corporations in market for executive ship

The Mallard Means Business

HULL DESIGN permits porpoise-free take-offs at gross load. Photo shows ship just breaking loose from water on take-off

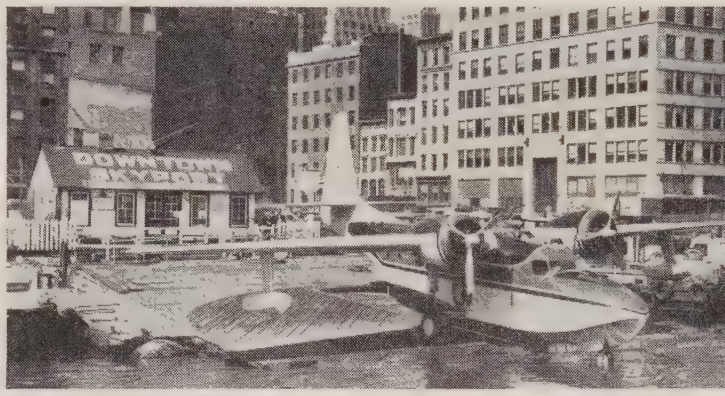


DOCKING at floating anchorage calls for care to prevent float damage. Copilot, in bow hatch, assists mooring

SO MANY of the aviation industry's manufacturing plans have gone by the board that it's almost like coming on a beacon in the wilderness to find one commercial aviation venture that has continued healthy since its conception during the last days of the war.

The plane is Grumman's amphibian *Mallard*, a completely new design, and its success is compounded by the fact that it has not just survived, but has been selling at a price of $132,000 fully equipped at an unspectacularly steady pace. A list of more than 35 sales in the two years since the experimental prototype first took to the air appears to have put a business seal of approval on this versatile executive and industrial transport.

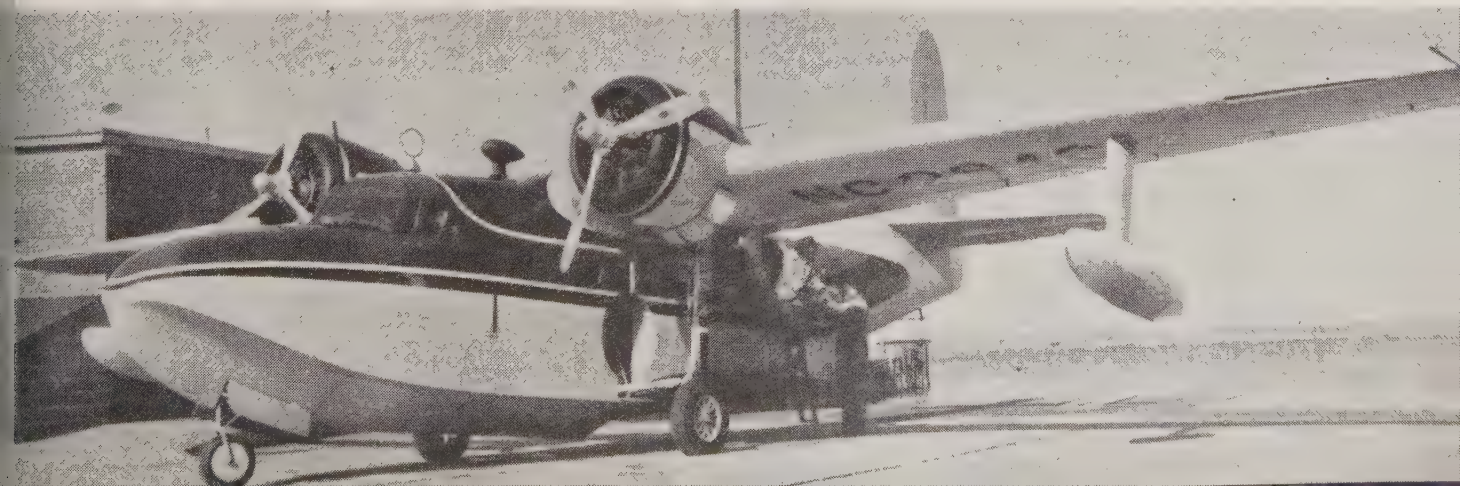
A production figure of under 40 planes in two years may sound small compared to the grandiose plans of some segments of the aircraft industry, but while other postwar production fantasies have shattered into bankruptcy or piled up terrific losses, the *Mallard* seems to



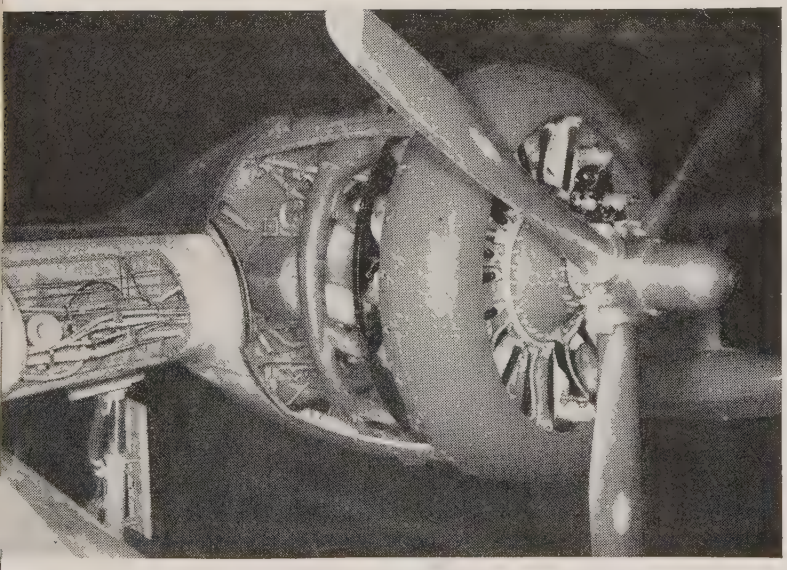
TURNTABLES, such as this one in New York (above), facilitate handling at in-town water bases. Coming off turntable, gear is kept extended for better control. In Canada (below) Mallards are used to haul supplies to camps

By JERRY LEICHTER

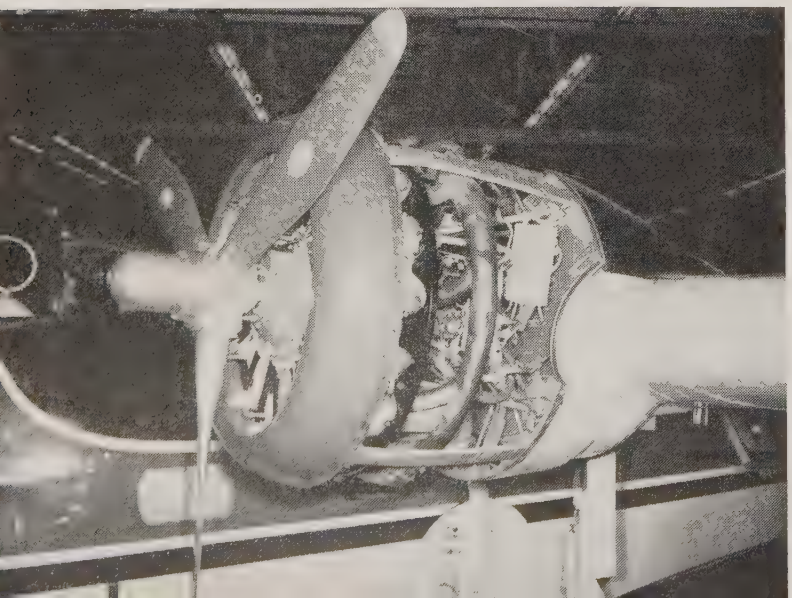
TRICYCLE GEAR of the Mallard permits level position on land. Tread of ship's main gear is 12 feet, 10 inches



OPERATOR of a Mallard for business in Canada is Toronto Globe and Mail newspaper. Ship covers Great Lakes area



ENGINE uncowled (below) shows clean installation on Mallard that allows plenty of room for maintenance operations. Right-hand view of left engine (above) shows wing access panel to wiring and fuel tank accessories



be going along at its minor pace, being continually produced under firm orders, filling a definite commercial need for a flexible, wide ranging industrial aircraft. The 10-passenger, high-wing, tricycle-gear transport is the only amphibian licensed by the CAA for scheduled airline operations, which guarantees for its private users the same type of utility and equipment found in airline service, with the added feature of landing facility off the beaten paths.

Let's be frank about amphibians—they come priced fairly high. But in the unending argument about the cost compared with landplanes no one has ever successfully disputed the fact that the extra cost pays for the extra utility, thus in matching usability against usability—amphibians against landplanes—the scales even up on the matter of price.

Opinion aside, here is what the *Mallard* is and what it does. Appraise it on the basis of what went into it and what its users get out of it and a fair estimate of the worth of a high-performance amphib appears through the usual murk of obscure reasoning and hardfelt prejudice.

Just to break down one major misconception, while the *Mallard* has been considered by some observers to be a big *Widgeon* (Grumman's five-place job) it is an entirely new design born out of the great refinements and advances made during the war in the study of hydrodynamics as applied to hull design. Aircraft hull designs of 10 years ago would be dangerous to use at today's higher power-ratings and high water speeds. *(Continued on page 36)*

MILITARY fuel requirements for the 70-Group Air Force are expected to have some effect on civilian fuel supplies

How Will 70 Group AF Affect Fuel Supply?

By WARREN L. BAKER

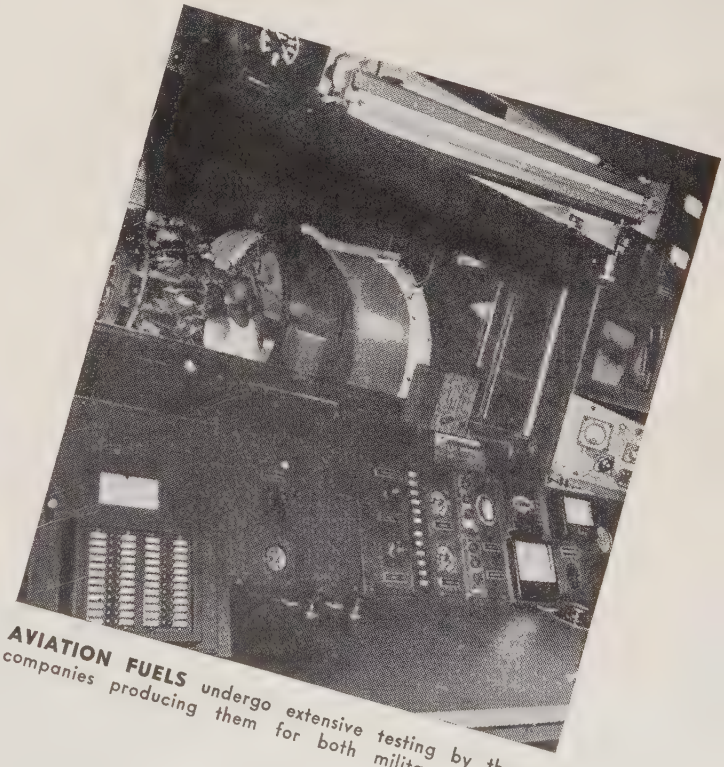
Aviation Dept., Socony-Vacuum, Inc.

ADOPTION of the 70 Group Air Force and other recent developments in the aviation industry have greatly increased demands for aviation fuel. While it is still too early to discuss all aspects of the effect of these developments on the civilian economy several factors which affect production volume of aviation gasoline should be pointed out.

When we consider aviation gasoline, the factor of octane levels becomes important. All aviation gasoline is high octane in the sense that the general run of stocks used in motor fuel are not suitable for aviation fuel. While Grade 80 aviation gasoline is slightly lower in octane than many Premium Grade motor fuels currently marketed, the latter generally contain significant amounts of tetraethyl lead, while the former contains little or no tetraethyl lead at present. For example, a recent Bureau of Mines Motor Fuel Survey showed average Premium grade gasolines containing 1.85 cc. tetraethyl lead per gallon at 79.4 octane number by the Motor Method which is typical of the type of octane rating used in this type of fuel. This corresponds on a clear basis to about 68-70 octane which is considerably below Grade 80 aviation.

Two methods are generally available to the refiner to increase octane levels to aviation requirements. They are:

1. Use of very high *(Continued on page 39)*



AVIATION FUELS undergo extensive testing by the oil companies producing them for both military, civil use

Powerline Patrol

CRUISING below level of lines and at 75 mph, Navion completes check in five hours; truck would take three weeks

THE business uses of privately owned aircraft are many and varied. Faced with the problem of patrolling the new 138,000-volt line that runs between Idaho's Hagermen Valley and Boise, the Idaho Power Company called upon a Ryan *Navion* to do the job. An indication of its success came from the company's pilot, Glenn E. Higby, who reported, "The airplane can check in five hours the same lines that require weeks when done by truck."

Flying on a level with and sometimes below the level of the powerline, the *Navion* is cruised at 75 mph indicated, with prop in full low pitch and flaps one quarter down for greater stability at that slow speed and in gusty air. Fuel consumption averages 6.5 gph.

"We are able to fly low and follow the contours of the ground," Pilot Higby explained, "because of the ship's excellent response to controls and its large reserve of power."

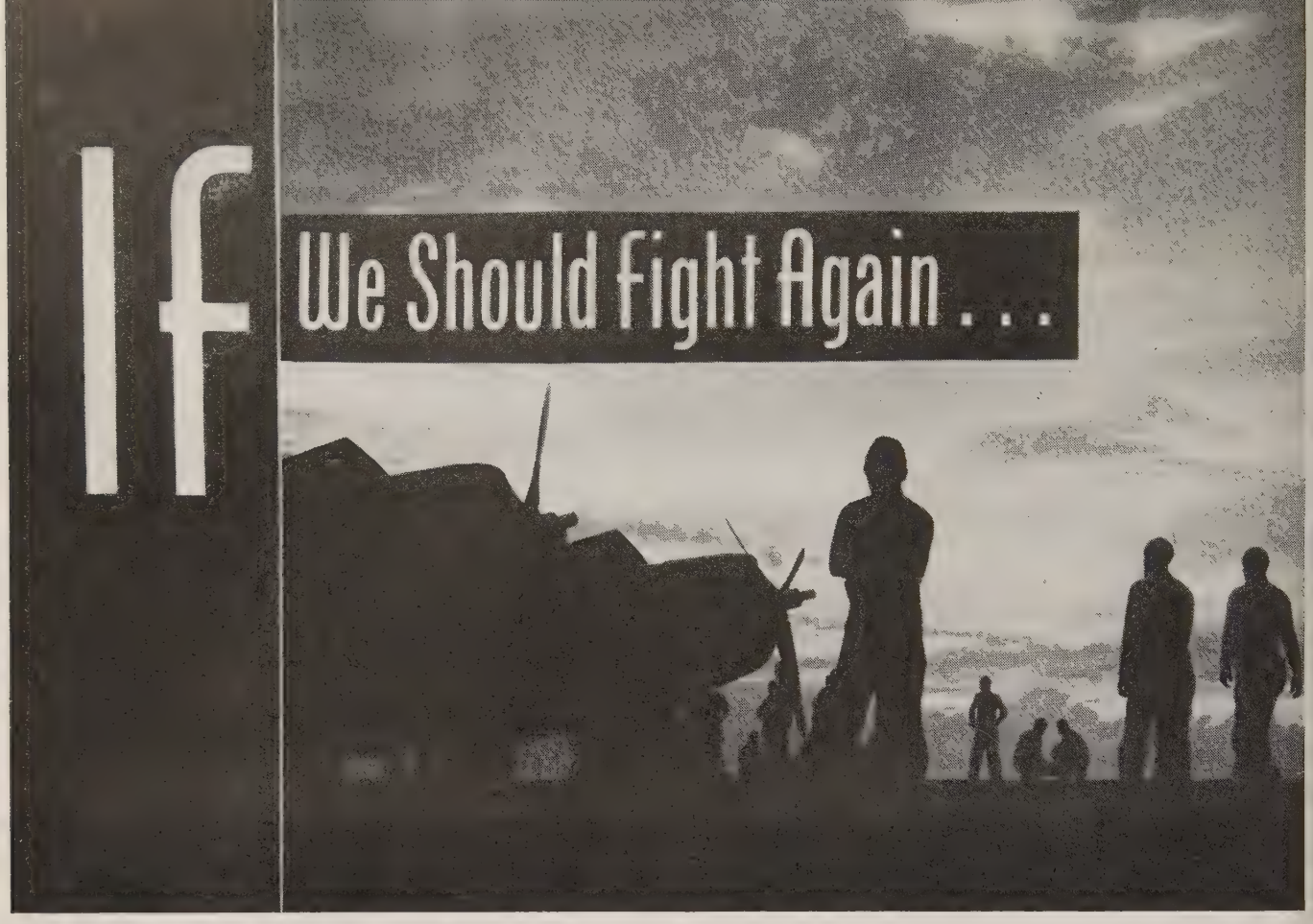
On a recent patrol flight in the Snake River Valley, the power company's technician spotted a large hay derrick dangerously close to the 138,000-volt transmission lines. In short order this information was relayed to the company's main office, and within a few minutes the farmer who owned the derrick had removed it from its precarious position. Evidence again that the privately owned business plane is daily proving itself an efficient and indispensable working tool.

PREFLIGHT includes thorough study of map. Here pilot and power company technician trace course they'll take

PATROL FLIGHT finds ship burning 6.5 gallons of gas an hour; flaps are quarter down and prop in full low pitch

POWERLINE CHECK discloses hay derrick dangerously close to 138,000-volt lines. Farmer will be notified quickly

If We Should Fight Again . . .



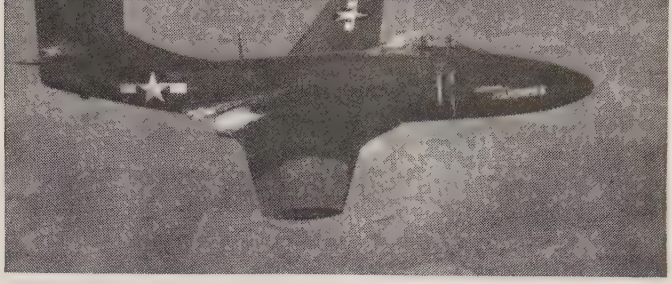
NAVAL AIR POWER is the heart of the Navy. To project that potent force against an enemy, wherever over the vast area of globe he may be, necessitates creation and use of the highly specialized aircraft carrier

Report of the role Naval Aviation plays in National Defense program

By Rear Adm. T. C. LONNQUEST, U. S. N.

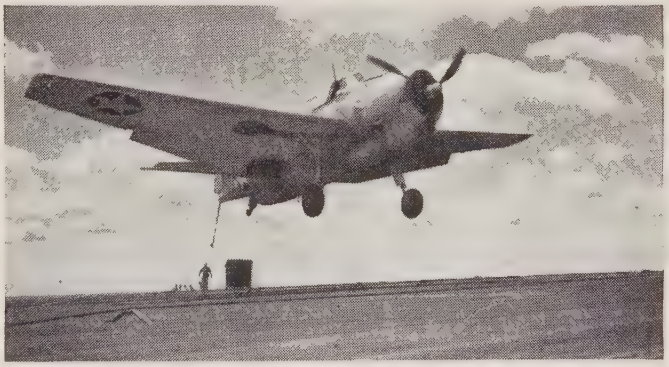
IF ANY doubt existed prior to World War II the latter made it abundantly clear that the first requisite for success in military or naval operations is air supremacy.

Circumscribed and handicapped by technical limitations, air power in World War I provided no more than a hint of its tremendous future potentialities. In World War II, however, air power came magnificently of age and the record of its accomplishments is a tribute to the fighting spirit, the courage, the sacrifices and the technical competence of those who forged and

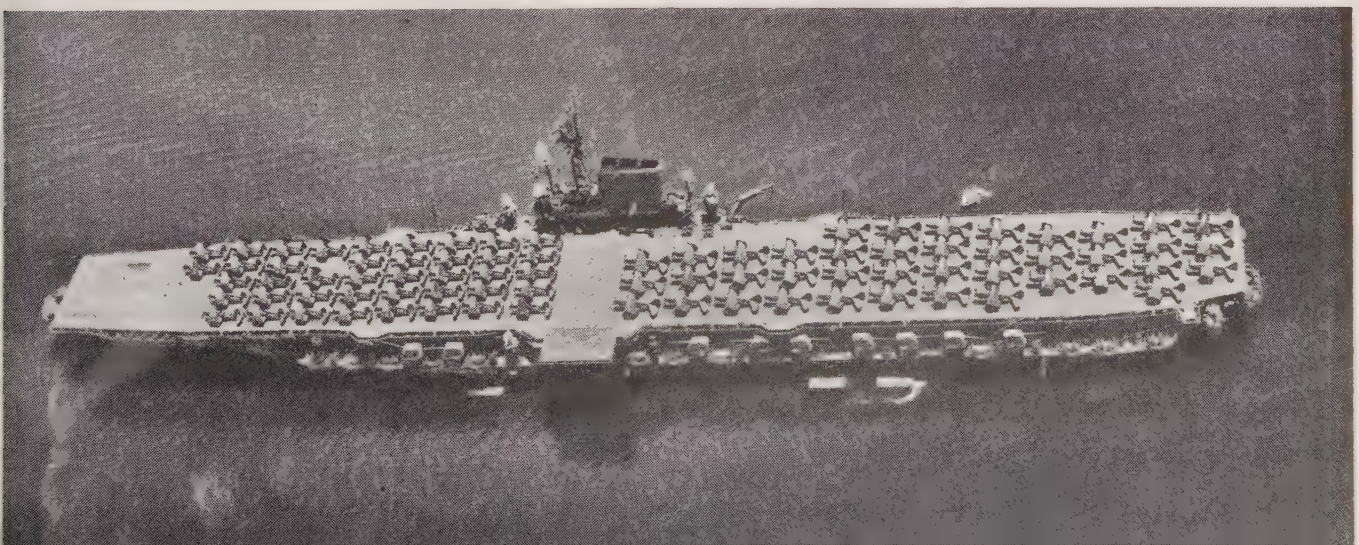


DEVELOPMENT of fighter planes for carrier use resulted in McDonnell Banshee. Squadrons are now being readied

MOBILITY of the carrier task force extends the range of Navy's fighter aircraft. To the carrier, the sea is not a barrier, but is a highway to the combat area. In World War II, Navy operated 110 carriers, and lost only 11



DESIGN of Navy aircraft is governed by environment in which it operates, i.e. limited deck space, take-off area



RUGGEDNESS of construction of Navy fighter planes is evidenced in this photo of badly damaged Curtiss Helldiver which was flown back to carrier in World War II. Navy, too, is concentrating on pilot protection gear

utilized and supported this most formidable agency of war.

The first and by far the most valuable aid which total effective air-power-in-being can render to this country and to the world is to prevent war from occurring. This, by threat of instant and devastating retaliation.

Important as is this threat of retaliation, it is only the first of several major aspects of over-all national defense. We must not fail to recognize the essential fact that should war occur it will demand the absolute maximum of coordinated national effort from the military, from industry, from science and from the nation at large. In particular, it will not be won by a single type of weapon nor a single agency alone. On the contrary, it will require every significant weapon and every element of team work that can effectively be brought to bear upon our proper military objectives.

In describing the coordinated relationship between sea-air power and the over-all aspects of national defense, it might be helpful to outline broadly the major operational aspects likely to appear in a war of the near future. Before doing so, however, certain basic elements which provide a framework of reference for the problem as a whole, warrant consideration.

The first basic element is the premise of *retaliatory* war. Popularly and glibly this tag has been used to identify a concept of war of the future, but we should understand that the term has a somewhat specialized meaning.

What we do *not* mean is reprisal in kind — an eye for eye and a tooth for a tooth. Rather the meaning is this: that appropriate to our democratic ideals our nation has, in the past, shown a reluctance to strike military blows until after significant overt action on the part of an aggressor nation.

As an antidote to an ideology of Pearl Harbor-type treachery, we propose a condition of instant and effective readiness. We must recognize, however, the acceptance of such a philosophy entails some of the elements of beginning our active war looking into the gun barrel of an antagonist who will already have taken initial steps to damage our military position and that of our potential allies.

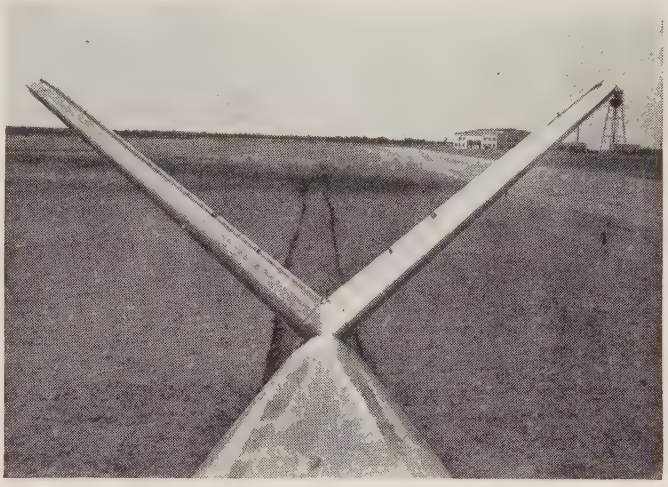
A second basic premise is that we are committed to *global war*. By this we mean that the nature of air power — upon which our National Defense is built—gives it wide freedom from the limitations of topographical barriers, subject only to the problems of radius of action and all-weather capabilities. This freedom of action, available both to our- *(Continued on page 38)*

TWIN-QUAD'S belly landing on grass alongside runway proved the rugged construction of this 20-passenger transport

Twin-Quad Test

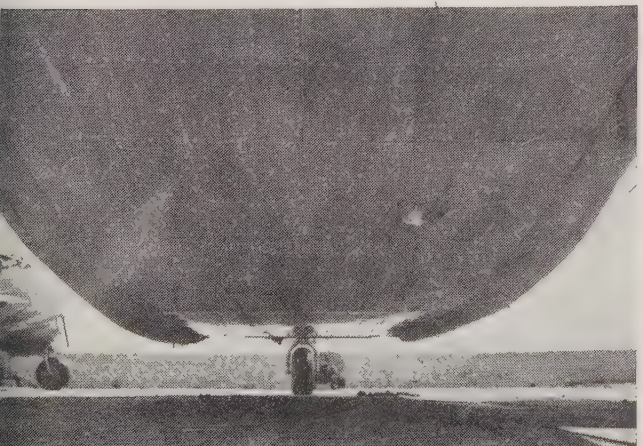
ONE of Beech Aircraft's recent developments has been the *Twin-Quad,* a junior-sized four-engine transport swinging two props. Proof of the ship's rugged construction came the unexpected way when the *Twin-Quad,* on a routine flight, developed trouble with the hydraulic system, and the landing gear couldn't be extended. The factory test pilot called the control tower, told the operator of his difficulties, and then came in and made a perfect belly landing on the grass alongside the runway. No damage at all was done. In fact, the keel tracks showed that the plane's bottom didn't touch the ground at any time. There was no buckling of the skin on either the sides or the bottom of the ship, and the keel showed only local deformation of the fairing skin. What's more, the pilot reported he'd had absolute rudder control during the entire landing "slide" of 615 feet.

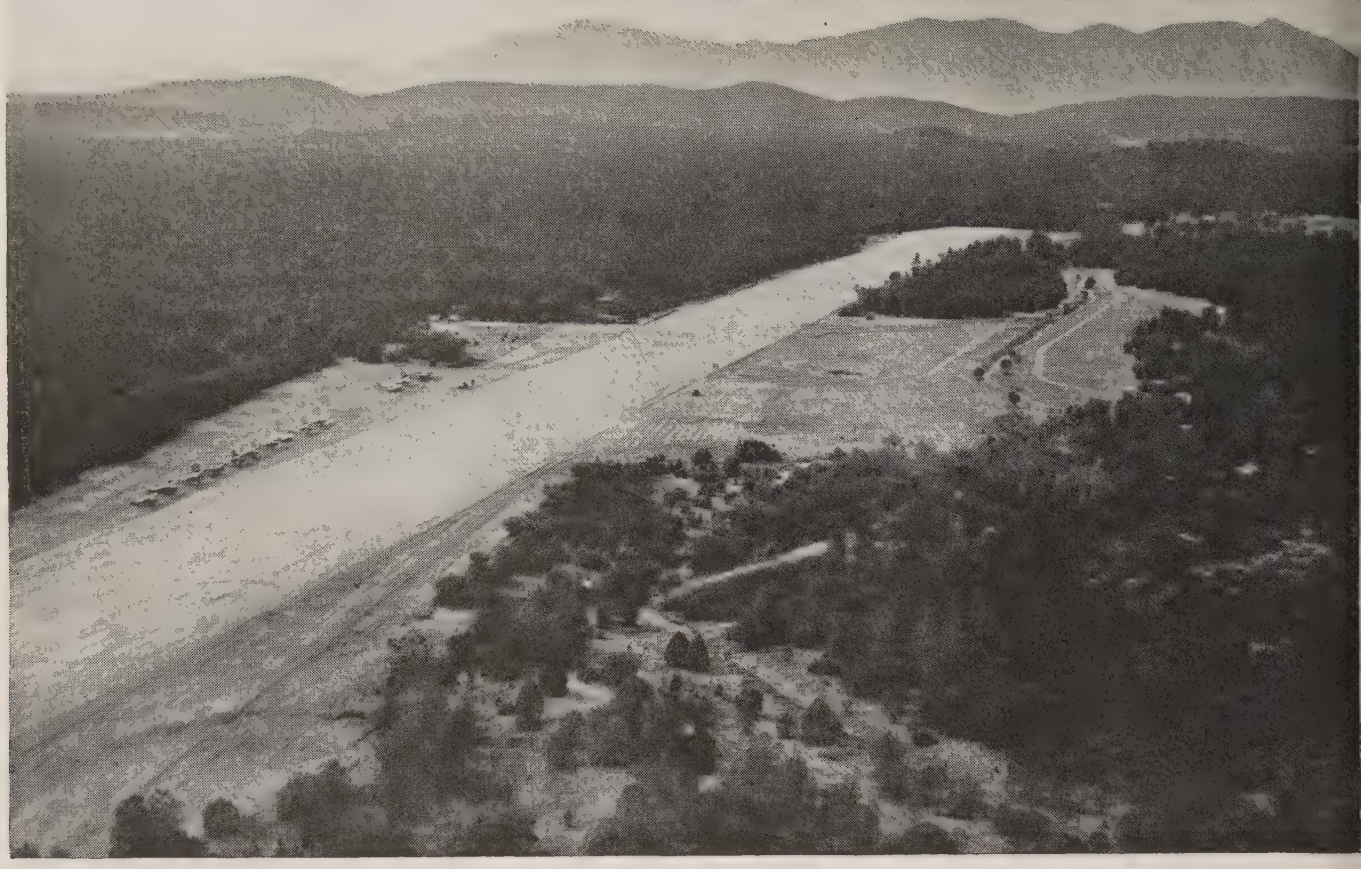
Call this proof the hard way that Beech again has built a sturdy ship, and one with built-in safety features for emergency use. +++



SHIP'S V-tail was effective in directional control during emergency landing. Note tracks made by ship's keel. Getting ship up on its gear called for digging shallow trench, popping gear via compressed air from a bottle

CLOSE-UP shot of Twin-Quad's bottom, taken after it was up on its gear, shows its completely undamaged keel





ARIZONA haven for the private flyer is the Payson Air Park, located just 35 minutes' flying time from Phoenix

Payson Patter

By CARL KENT

Aviation Editor, Arizona Times

EVEN with 364 flying days a year in Arizona, residents of the Valley of the Sun never have a problem of finding someplace to fly that offers relaxation, scenic beauty, and good food.

Just 35 minutes flying time from Phoenix is Payson Air Park, resting in a quiet draw, 4,000 feet above sea level, and just under the ruggedly picturesque Mogollon (Muggie-own) Rim.

BREAKFAST FLIGHTS to Payson are regular Sunday events, and seldom missed by the flyers in that region. Breakfast is an outdoor affair, followed by hunting, fishing or whatever entertainment the visiting flyer prefers

PAYSON activities, as far as the town itself is concerned, centers around combination post office, shop

PRIDE of one recent Sunday excursion to Payson was a new Cessna 195. Its owner is Dr. Harold Davis (center)

FLYERS all arrive around 8 or 8:30 Sunday mornings, but they leave whenever they want to. Note line-up of ships

These rough-hewn mountains, and sprawling acres of virgin timber have been the setting for many romantic yarns about the west.

On this particular Sunday morning, 16 airplanes, their occupants bent on an outdoor breakfast, swarmed onto the Payson Airpark strip, carved out of the high timber country.

They were a mixed group, all ages and hailing from all walks of life. Three doctors and their families, a Phoenix clothing merchant and his wife, a sailor on leave, Real Estate, and businessmen, yes, even instructors with students.

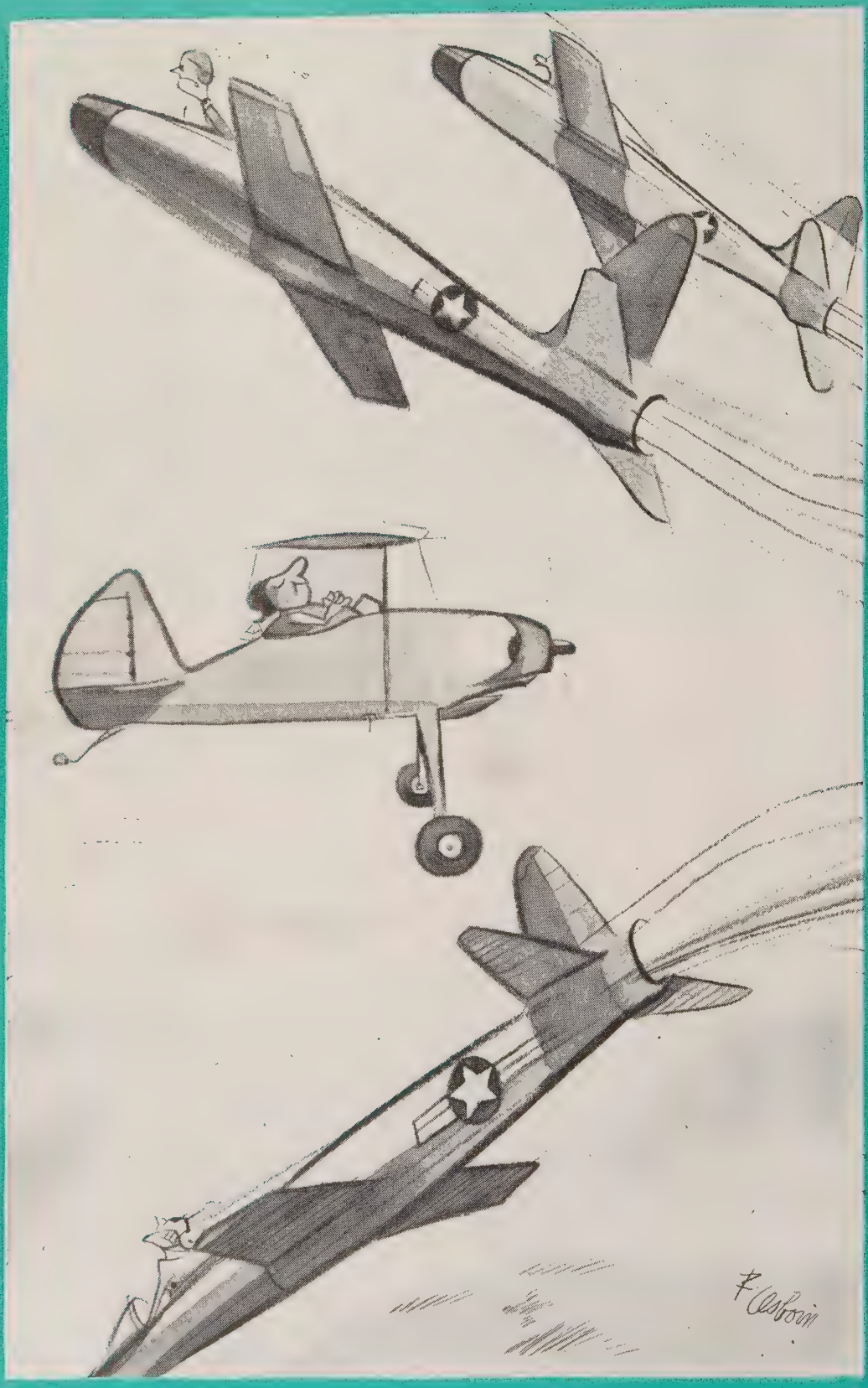
This breakfast flight had been arranged by Frank Shelton of Anderson Aviation at Sky Harbor Airport, and Bill Ralston, owner of Paradise Airport. These two boys have a trip cooked up most every week-end. The extent of the trek depends upon whether the group is looking for hunting, fishing, or just a few hours of fun and breakfast around a friendly fire.

Payson Airpark is the partial culmination of a dream shared by Buck Dooley and Frank Maddox of Phoenix. Both are sportsman pilots and have developed the air strip. In the near future they are planning a clubhouse, swimming pool, and Air-Tel accommodations at the field.

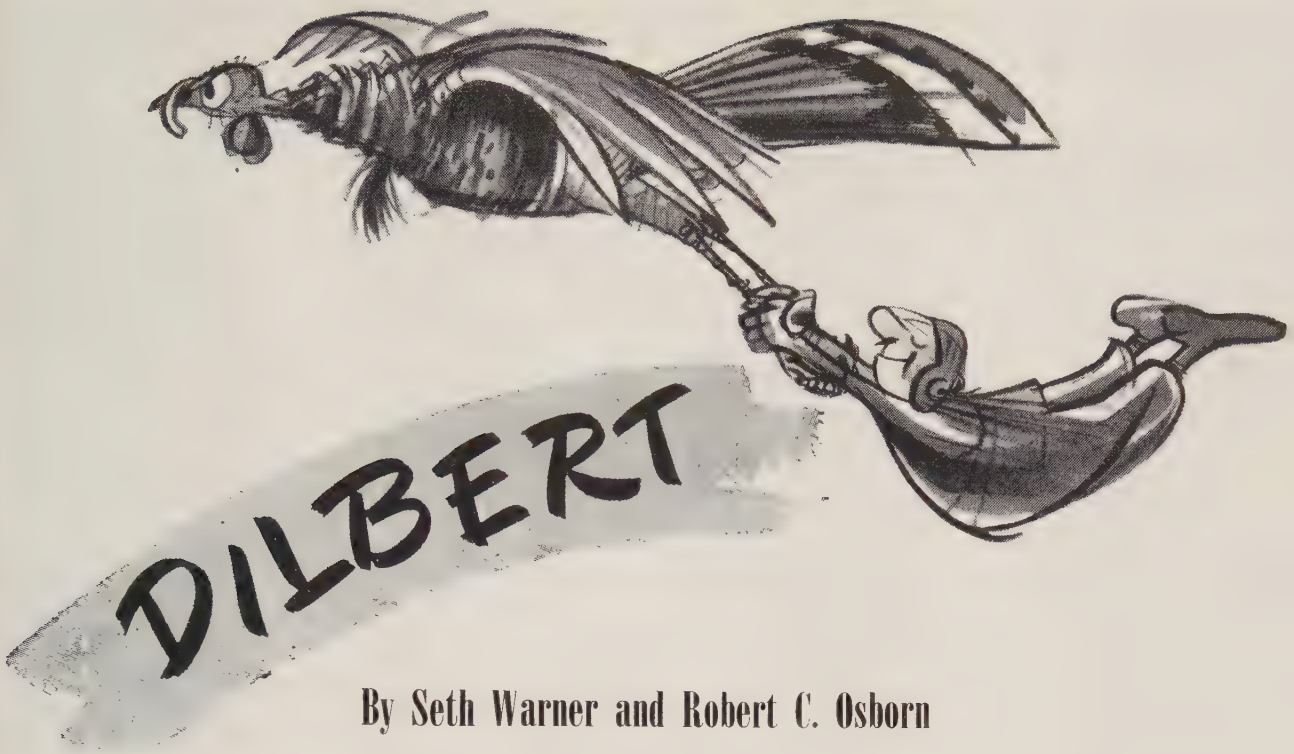
AUTHOR KENT reflects the fun of the Payson trip in a conversation with another pilot

After eating a lusty breakfast, the group usually breaks up into smaller parties. Some go on hikes searching for—and usually finding—deer or antelope. A few must be back in Phoenix for an afternoon engagement. They make their departures at irregular intervals all day, but the arrival in the early morning all happens in a matter of minutes.

There is never a time to leave, but breakfast is always at 9 a.m. and few flyers around Phoenix miss the ham and eggs, and coffee.



Famous last words (Dilbert's): "Let the other guys do the lookin'!"



By Seth Warner and Robert C. Osborn

A Pound of Prevention—Every winter a bunch of Dilberts learn the hard way that Ole Debil Ice is a dangerous passenger to carry. They learn this through failing to comply with one or more of the warnings listed below, which have previously appeared in this column.

On The Ground—1. Don't attempt to take off with frost on wings or tail surfaces. A deposit that is barely visible may double the wing drag and reduce available lift. Rubber scrapers or waste rags should be used to remove frost.

2. Don't attempt to take off with any loose snow on the wing or tail surfaces. Snow also reduces lift and it may be covering a hard ice formation caused by melted snow which has refrozen. Snow may be removed from flat surfaces by using a rope or strip of canvas and, with a man at each end, "sawing" it off.

3. Don't try to take off with ice on the airplane or prop. Never attempt to remove ice by applying hot water. It will freeze again and produce a worse condition.

4. Don't take off without first testing all controls, to make certain the hinges have not frozen.

5. Don't warm up in a fog when temperature is near freezing. Ice may form on propeller, wings and stabilizer in back of prop blast.

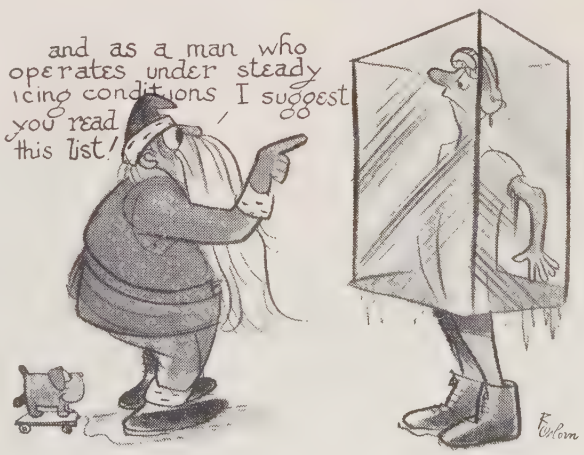
6. Don't taxi fast over pools of water when temperatures are near freezing. Splashed water may form thin ice on wings or stabilizer and may ice up brakes, retracting mechanism or landing gear.

7. Don't taxi fast on ice-coated runways or taxi strips. It's surprising how many pilots slip into trouble on this one.

8. Don't take off during a wet snow. It is likely to freeze as it strikes the plane.

9. Don't forget that in cold weather engines heat up slower and are, therefore, more prone to foul. They should be thoroughly cleared just before take-off.

10. Don't take off into a known icing condition when the plane is not equipped with modern deicing equipment. Even though it is, flights should not be planned to go through continuous icing zones. *(Continued on page 40)*



CAOA REPORT . . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminatory legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary, to bring about improvements in aircraft, equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 444 Madison Avenue, New York 22, N. Y.

CAOA Forum . . .

Over a hundred pilots and executives of corporations employing company planes attended the recent CAOA Forum at the Hotel Statler in Washington, D. C. Shortcomings of the CAA Airways Traffic Control, Weather, and the need for better executive-type aircraft and service were discussed at the conference between representatives of the CAA, the aircraft industry, fixed-base operators and members of the Corporation Aircraft Owners Association.

Keynoting the forum was Mr. William B. Belden of Republic Steel Corporation, chairman of CAOA, who predicted a five-fold increase in the number of corporate aircraft in operation today if and when improvements in service, maintenance and operation are effected. Chairman Belden pointed out that the business use of aircraft provided the aircraft industry its greatest opportunity for growth and expansion, and that solution to the existing problems of corporate aircraft operation would insure the future success of private air transport as an aid to business.

CAA Participation . . .

Speaking for the CAA, Deputy Administrator Fred B. Lee declared that the CAA is constantly trying to improve service along the airways, and he assured the corporate pilots that reports of irregularities in service at control centers throughout the country would be heeded by CAA officials and that improvements would be immediately made. Other CAA speakers were Mr. John Huber and Mr. A. Delatte. Consensus of CAA opinion was that improved service would come with installation VHF equipment. Mr. Lee added that the CAA was now involved in experimental work on a flared guide path, and that in about 12 years we would be going into ultra high frequencies.

Officials Present . . .

Other speakers at the CAOA Forum were Capt. Gill Robb Wilson, Aviation Editor of the New York *Herald Tribune* and one of the nation's foremost aviation proponents; Mr. Harry Meixel, Executive Director of NATA; Beverly Howard, President of NATA (National Aviation Trades Association); Joseph T. Geuting, Jr., Manager of Personal Aircraft Council of the Aircraft Industries Association; Major Al Williams, of Gulf Oil Corp.; Mr. H. S. Christensen, of Aircraft Radio Corp.; and Wayne Weishaar, secretary of ATS. These gentlemen lauded the formation of CAOA and assured the Association of complete cooperation in developing industrial aid flying.

Executive Aircraft . . .

Replying to Chief Pilot T. W. Hotze, of Reynolds Metals Co., who queried the aircraft manufacturers regarding the development of new executive-type planes, Mr. Greever of Beech Aircraft reported that his company had an investment of about 5 million dollars in a four-engine plane employing two props which was designed for executive and feeder-line service. This ship, the *Twin-Quad*, will have a load of 6,200 pounds, 375-hp engines and will cruise at 200 mph with a maximum range with standard tanks of 1400 miles. This plane, said Mr. Greever, will probably sell for something in the vicinity of $220,000.

Radio Reception . . .

In answer to questions regarding VHF radio reception, Mr. H. S. Christensen of Aircraft Radio Corporation suggested that all VHF equipment, both ground and airborne, be checked from time to time for sensitivity. According to Mr. Christensen, radio receivers have been known to lose sensitivity over a period of time, and only a thorough check will indicate whether or not this is the case with some VHF equipment that seems to lack range and clarity of reception.

News Notes . . .

The Kaman Aircraft Corporation, of Windsor Locks, Conn., announces a helicopter designed specifically for utility use by industry. Called the Model K-190, the 'copter is expected to sell " . . . for the price of a high-class automobile." It is a three-place helicopter powered by 190-hp Lycoming engine.

The former Naval Air Station at Fort Lauderdale, Florida, is now opened to transient civilian aircraft . . . and particularly executive multi-engine aircraft. Facilities include four 5,000-foot paved and lighted runways, low gasoline and storage rates and maintenance service. There is also a restaurant at the field.

Southwest Airmotive has now been authorized as distributor and over-haul station for Wright Aeronautical. Territory includes Texas, Oklahoma, New Mexico, Arkansas and Louisiana.

Civil airplanes in the U. S. have increased from 83,571 in 1947 to 97,743 today. A CAA official who prefers to go unnamed maintains there will be 400,000 civil aircraft by 1955.

Pacific Signal Company announces a new portable landing light. The light contains a flasher unit on top and a powerful white beam to land by. This company has also developed an emergency flare which will burn for four and a half minutes. Credit for those two devices goes to C. A. Glock, of Pacific Signal Company in Calif.

While no "award" was made to the CAOA Forum participant who traveled the greatest distance (or the shortest) to attend the get-together at the Hotel Statler, if "awards" had been made, Charlie Kidder of Grand Central Airport Co., Glendale, California, and A. E. Leonard, Jr., of Consolidated Vultee in San Diego, Calif., would have snared them. For the shortest distance, several would have to scrap for it: Wayne Weishaar, Monroe Brown, R. K. Fox, Joe Geuting, J. M. Hadley, Harry Meixell and Don Ryan Mockler. They just hopped cabs from home to the hotel.

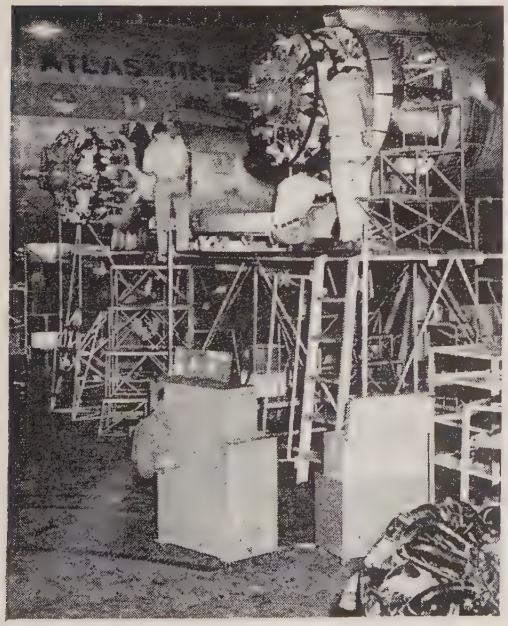
EXECUTIVE TRANSPORT called "Expediter" is used by its owner John H. Whitney, President of J. H. Whitney & Co., for business travel. The ship is a luxury-lined DC-3

50,000 trouble-free miles around the globe!

Southwest Airmotive mechanics and technicians who overhauled the "Sky Merchant" for its 50,000-mile 'round-the-world flight. The Atlas aircrew stands at right.

Over seas, deserts, and mountains of 28 countries, the Atlas Supply Company's DC-4 "Sky Merchant" flew around the globe on a unique mission of goodwill. Aboard were crewmen, Atlas representatives who displayed the company's famed automotive and aeronautical products, and 17 American business men who gained valuable first-hand impressions of conditions abroad.

One hundred days and 50,000 miles after the journey's start, the Douglas' wheels touched home base again in USA. It had flown through every conceivable kind of weather, through wide extremes in temperature and on-and-off runways of myriad descriptions. Not once did the aircraft or its SAC-installed engines develop mechanical trouble.



From the Atlas aviation experts, there was nothing but praise. They gave much of the credit for a trouble-free trip to Southwest Airmotive where the "Sky Merchant" received a major going-over.

This record reflects the same dependable service which for 16 years has kept air fleets flying safely and surely throughout the Western Hemisphere. Check with Southwest Airmotive before your next aircraft or engine overhaul.

"THE FLAT RATE COMPANY"

E S N W

Southwest Airmotive Co.

CAA Approved Repair Station No. 195

LOVE FIELD, DALLAS

Mallard...

(Continued from page 22)

Aided by experiments and studies made in conjunction with the Navy Bureau of Aeronautics, the NACA laboratories, technical schools and other aircraft companies, Grumman decided early in 1945 to develop an intermediate executive transport, somewhere below the new airliner sizes, but above the level of the personal-class aircraft. The high-performance hull that is the basic part of the *Mallard's* design is based on testing and research accomplished by Grumman with the assistance of the Experimental Towing Tank of Stevens Institute of Technology.

The chronology of the *Mallard* design runs a swift course after the first decision for a new enterprise. The first prototype flight was made on April 30, 1946, and was followed by exhaustive hydrodynamic testing to determine the possible hull modifications that might be necessary after flight stability had been established.

The experimental plane began certification tests on June 30 and completed the routine on August 20. CAA approval to license the first production airplane was granted on September 7 after 155 hours of flight testing, which included 70 hours for the CAA tests, that date also marking the completion of about 100,000 engineering man hours on the project. The first certificated airplane was delivered to J. P. Bickell, of McIntyre Porcupine Mines, Ltd., Canada, on September 27, five months after that first flight.

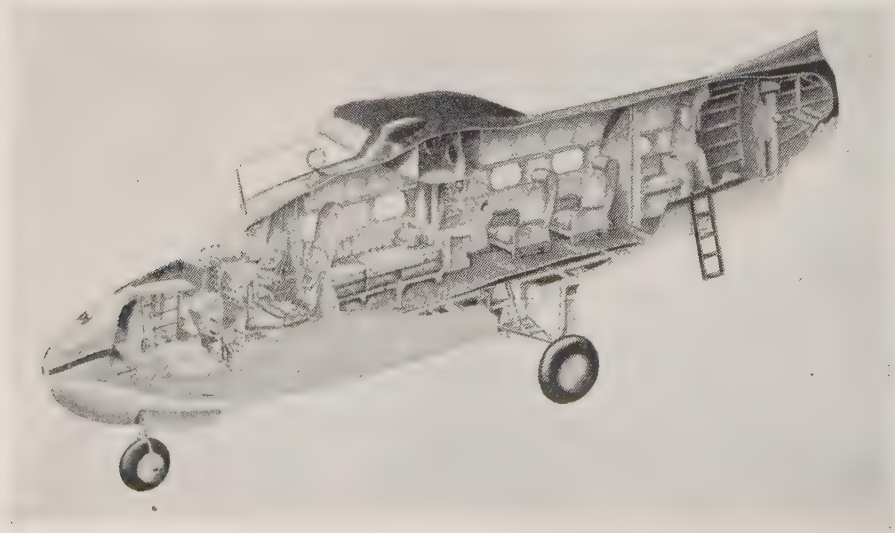
During the next three months a Grumman sales pilot-engineer accompanied every delivered airplane and stayed with it during its early owner flight period to accumulate direct service test experience to send back to the plant at Bethpage, L. I., for the guidance of the factory staff in making any modifications.

That is the bare essence of the *Mallard's* beginnings. Minor changes on any production aircraft always continue to be made on the basis of service experience and new owner requirements, but the *Mallard* has acquired comparatively few.

Why did Grumman decide on an amphibian for its entry in the large executive field? One answer, of course, lies in the great amount of previous amphibian design and production experience Grumman has piled up since the early Thirties. The other, complementary, answer is based on the expansion of U. S. trade interests throughout the world, coupled with standard acceptance of air transport for business purposes. The absence of adequate landing facilities in most of the postwar centers of trade and trade exploration makes it vitally necessary for a plane to be able to fly not only under all types of conditions, but also it must be able to utilize any type of landing area that might be available. The history of world-trade expansion has always been based in the past largely on navigable waterways. To bring the speed of air to the scene one must, of necessity, use whatever facility is available. If a trade center has been based on the proximity of trails, roads or railroads, use a land strip, but if it has depended on water transportation or the use of water, then adopt the aircraft to that medium, too. Hence, an amphibian for universal exploitation of every opportunity.

The proof of Grumman's market expectations is in the list of types of owners now operating *Mallards* in every part of the world. A rundown shows the line-up as follows: two great newspapers, one whose territory includes the Great Lakes and St. Lawrence River areas and the other practically the entire East Coast of the U. S.; two government bureaus, one Canadian and one U. S., whose duties involve waterway and power-site survey; six oil companies, two of which own two *Mallards* each, all using their planes for a wide mixture of executive transport, engineer transport, vital oil survey work and long-range, over-water linkage of company segments; many manufacturing and construction companies whose interests range from widely separated mill properties to ventures in virgin Canadian lake territory; and a further wide variety of industrial and private users whose interests and need for transportation have taken them over most of the world's surface. Only a high-performance, fully equipped amphibian could fill that multitude of ownership requirements.

CUT-AWAY VIEW of the Grumman Mallard shows a typical executive-type interior which includes a settee or lounge as well as the regular airline-type seating arrangement



That sounds all to the good—here's a plane that can fly under airline conditions with a full-rated pilot at the controls and should be able to land anywhere a clear strip exists on land or water. Now a few sad facts come to life. Some of the self-esteemed, forward-looking municipalities of the United States are not quite as good in matters of air-transportation facilities as they may sincerely believe.

Under perfect conditions, every major business center in the United States, with almost no exceptions, has a water area theoretically suitable for amphibian and seaplane landing that will bring the flying businessman closer to the center of the city than the great majority of available land bases. Unbelievable utility would be possible in certain cities where a man should be able to land his executive transport on a river surface within a half-dozen blocks of the center of the city's trade. Well, man has often disdained the assets of nature in the past and there's no exception in this case. Of course, in some cities, close-in land bases are available that make it more desirable to lower the wheels and come in on asphalt instead of water, but the existence of clear water does give a choice of action and many cities do handicap the flying businessman of today and the near future by neglecting their waterway assets.

Even in cities where seaplane facilities were conscientiously installed many have become hopelessly inadequate in the face of aviation progress. The record shows the proof: Chicago has a good 3,000 to 4,000-foot land strip south of the yacht club basin in addition to the water space and that is lucky because the seaplane ramp won't take a plane larger than a *Widgeon*. Milwaukee has a water-land strip combination for a choice as has Duluth. Detroit has water landing space at the center of town but the ramp is dangerous for heavy aircraft. Landing in the river at New Orleans is hazardous because of driftwood. The ramp at Miami is not up to heavy aircraft. St. Petersburg, admirably enough, has a landing strip in the center of town, better situated than its adequate seaplane base. A major city like New York has only one ramp, at the foot of Wall Street, capable of supporting a *Mallard*, but it happens to have one of the few turntables in the country outside of military bases which can handle a plane the size of the *Mallard*. The record is both good and bad.

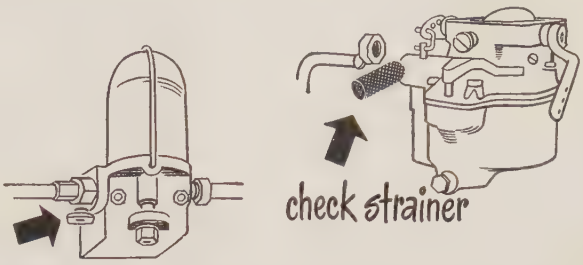
The hazards listed attendant at some water bases possibly give the misleading impression that the *Mallard* is a heavy, monstrous aircraft that belongs only in wide open water when it comes in wheels up. Nothing could be farther from the truth. The *Mallard* operates easily off most conventional water areas that accommodate all other types of seaplanes.

Granted that the Grumman amphib is big and weighs 12,750 lbs., gross. It carries its two-man crew and a load of up to 10 passengers over a range of from

(Continued on page 43)

PLANE FAX

A page of service tips for private flyers and fixed-base operators

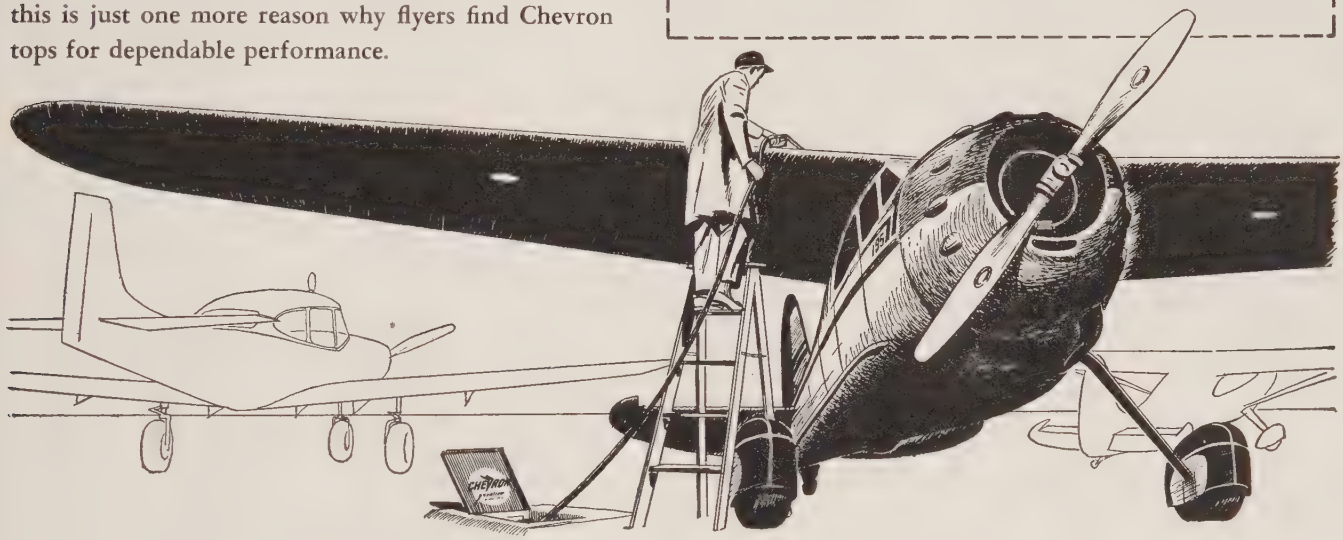


How to avoid contamination in fuel systems!

Dirt and water in your fuel system can prove just as embarrassing as an empty tank. That's why, to avoid the possibility of trouble in the air, check your filter bowl and strainers and drain tank sumps frequently.

How can you be sure of getting pure gasoline?

One of the safeguards that insures absolute purity for Chevron Aviation Gasoline is water-locking foot valves at the base of the tank's suction stub. Strainers and centrifugal filters insure the further removal of water and moisture. These safeguards, of course, are in *addition* to the precautions that mark every step of the complex refining process of Chevron Aviation Gasoline. And this is just one more reason why flyers find Chevron tops for dependable performance.



Contamination danger in hydraulic oils, too!

Because of the small orifices and clearances in aircraft hydraulic mechanisms, hydraulic oil must be protected from the slightest possibility of contamination with dirt, scale or other foreign matter. That's why RPM Hydraulic Oils are packaged in special inner-coated drums and carefully inspected cans to insure their unvarying quality.

CHEVRON AVIATION GASOLINE

RPM AVIATION OIL

Standard Oil Company of California

"We'll take better care of your plane"

If We Fight

(Continued from page 28)

selves and the air force of a potential enemy, entails a dual responsibility—first that we reach into every quarter of the globe to exploit the potentialities of air power where appropriate to our military objectives, and second that we be competent to deny such freedom to the enemy, —again in every quarter of the globe.

That brings us to a third basic element—that we must be prepared for an *oceanic war.* It is no depreciation of the capabilities of air power to point out that the facts of geography remain unchanged, that broad and very wet oceans surround the more accessible boundaries of our continent. In brief, all the elaborate mechanism entailed in the problem of fending off war from our shores and transferring it to the homeland of the aggressor demand recognition of our oceanic position and the importance of sea power.

A fourth and obviously major basic element is the matter of the *atomic bomb,* which requires the evaluation of a host of imponderables. The tremendous destructive power of the bomb is beyond challenge. Written in the record of appalling destruction at Hiroshima and Nagasaki—and in the implication of such information as has been made public about subsequent tests—its technical potentialities establish the atomic bomb as a weapon which overshadows all others in planning for national security.

Neither this unquestioned fact, nor its use by the U. S. under special circumstances in World War II, necessarily identify the atomic bomb as the best weapon for every tactical situation.

Nor would our planning for offensive or defensive action be the same today as two or five or 10 years hence.

Space does not permit the detailed examination this important subject deserves, but there are certain conclusions which seem relatively clear.

1) The real hope of the future lies in rationalization of the problem on an international basis, with control of the atomic bomb vested in a body similar to the United Nations.

2) Pending such a solution, the U. S. will for a limited time retain a monopoly on the atomic bomb. This monopoly will last for only a few years, however.

3) Our defense mechanism must be organized to provide at all times the maximum practicable degree of security against atomic attack in any form.

4) Our plans for the military security of this nation must be of sufficient flexibility to include not only the means to achieve victory with conventional armaments, but to gain that objective by the use of other such weapons as circumstances may dictate.

So much for the background. Now to come to more concrete cases. If we are unable to prevent war from occurring, what general form will it take? What are the major operational aspects likely to appear in a war in the near future?

Broadly speaking, there are four major operational aspects of concern to us.

The first and most vital of these is *Continental* defense—the protection of our citizens and the security of the United States as an arsenal and base from which to launch aggressive offensive action.

The strategical concept for which our defense must be prepared is that attack will come without warning and that it may involve a variety of weapons including the atomic bomb. In the civil field, our country must prepare for sabotage possibly with atomic weapons and attempts to incite class warfare.

In the military field, we must anticipate enemy air bombing and airborne troop attacks, capitalizing in part, perhaps, on surprise seizure of intermediate bases. At sea, we may expect the appearance along our coasts of enemy submarines launching guided missiles. Our objective here, as previously implied, will be instant readiness for action before action becomes necessary. Secretary Symington phrases it: *"The safety of the United States demands that we have an impregnable air curtain—a curtain sufficiently strong so that no fleets of hostile planes or waves of guided missiles can reach the mainland of this country."*

And finally — and of comparable importance — we must have alertness and readiness, not only in the continental United States, but also far off-shore; defense in the depth where naval planes will combine with our own submarines to detect by radar and intercept approaching enemy aircraft or to forestall the seizure of intermediate bases vital to its purposes.

Touched off by the first attack on the U. S. and continuing throughout a war, a second major operational aspect will instantly arise —long-range air assault. Definitions vary, but under the general long-range air-power category might be included strategic bombing and airborne troop expeditions, primary functions of the USAF.

Obviously, solution of the problems associated with long radius of action and high performance are of particular interest in this operational aspect, but the extent to which operations in this category would rest on sorties from the United States would depend in some measure upon action which the enemy might take in the initial phases of the war towards seizure or neutralization of bases overseas.

The important question of overseas bases brings us to a third major operational aspect which I have termed *projection of our military power overseas*: operations intended primarily to bring us into closer tactically offensive grips with the enemy, and to follow the classic American pattern of carrying war to the soil of the aggressor.

These efforts fall into two general categories. The first is amphibious operations executed in conjunction with the Army and the Air Forces, with the general objective of seizing overseas bases from which land-based aircraft may operate with the improved effectiveness which comes from shorter ranges—or bases which may serve as beachheads for ground troops.

Overseas movements in this category will be characterized by the employment of air power in close integration. Enroute, enemy opposition will manifest itself principally in the form of submarine activity.

When in closer proximity to the enemy, air operations will become of major significance and carrier-based aviation, spearheading the amphibious operation, will have as its objective the establishment of local air superiority over the enemy and can provide the close support to ground troops during the assault phase.

The second general category in the projection of our military power overseas is the exploitation of naval carrier-based air power which, operating from its own mobile bases, can not only provide the air effort to support the seizure of beach heads and advanced bases which I just mentioned, but can also strike major blows on its own account.

A fourth major operational aspect which any conflict of the future will most cer-

(Continued on page 44)

"Sure, you can fly it . . . It's fool proof!"

Fuel Supply

(Continued from page 23)

octane blending agents such as alkylate, hydrocodimer, toluol and cumene.

2. Use of tetraethyl lead.

Of the relatively large number of blending agents used in the wartime 100 octane program, alkylate was by far the most important since it permitted maximum gasoline manufacture based on a limited supply of raw materials. Maximum war-time production of alkylate amounted to about 170,000 barrels per day. Essentially no new capacity has been installed since that time and a portion of it has been converted to other uses. One other factor tends to limit alkylate production during peacetime in that the same components which improve the starting and warm-up characteristics of motor fuel serve as the raw material for alkylate production. Manufacture of one gallon of alkylate can result in a deficiency of these components in over 50 gallons of motor fuel, thus impairing its starting and warm-up performance. Since alkylate is used in all grades of aviation gasoline, total productive capacity of all grades is limited by the volume of alkylate capacity.

Increase in tetraethyl lead content offers the most feasible method of increasing aviation gasoline production in the short run. This reduces the concentration of alkylate required to reach a given octane level and thereby spreads available supplies of this limited material over more gallons of aviation fuel. The following tabulation illustrates the effectiveness of tetraethyl lead in extending alkylate supplies.

Tetraethyl Lead Content		Approximate Gallons of 100 octane gasoline which can be produced from 100 gallons of alkylate
cc./Gallon	Per cent by Volume	
2.0	0.053	107
3.0	0.080	125
4.0	0.106	143
4.6	0.122	152
6.0	0.159	174

History of the tetraethyl lead content of Grade 100/130 aviation gasoline during the war reflects these trends. Maximum tetraethyl lead contents permitted by Govt. specifications were increased from 3.0 to 4.6 cc./gallon as volume demands rose.

Several questions in regard to the military requirements for aviation fuels will have an important influence on the effect on civilian requirements. These are:

1. At what rate will jets replace reciprocating engines?

2. What type of jet fuel will be used? Possibilities include gasoline of high or low octane, kerosene, fuel oil or mixture.

3. What tetraethyl lead contents will be permitted in reciprocating engine fuels?

Only after military requirements, both as to volume and quality, are resolved can we begin to assess accurately their effect on the civilian economy. Even after these are apparently resolved, they are always subject to change. For example, it has been estimated that Operation Vittles, supplying Berlin by air, consumes about ten million gallons of aviation gasoline per month, although this figure is subject to considerable variation, depending upon the type of aircraft used.

Dilbert

(Continued from page 33)

1. Don't apply brakes suddenly after landing on a runway that may be coated with ice. Use the full runway. Check conditions by radio before landing.

In The Air — 1. Don't fly through showers or wet snow when temperature at flight level is near freezing. It will freeze as it strikes.

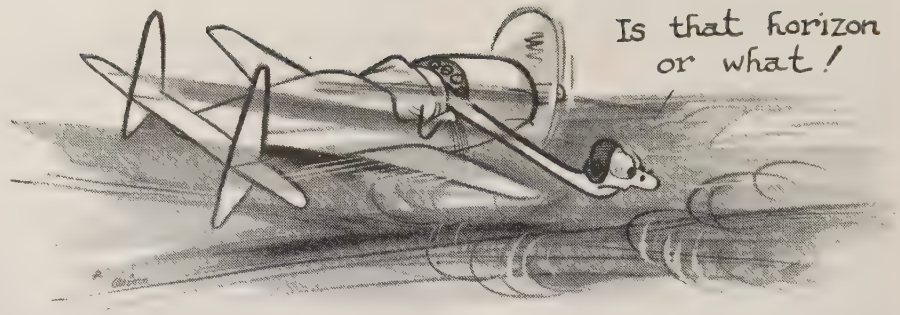
2. Don't fly parallel to a front under icing conditions.

3. Don't fly into clouds close above ridges or mountains. Four or five thousand feet clearance should be maintained when flying on instruments through clouds at freezing temperatures.

4. Don't fly into cumulus clouds at low temperatures. Heavy glaze ice may be encountered.

5. Don't forget to turn on the pitot tube heater when needed. Pitot tubes should be covered when planes are parked.

6. Don't land with wing de-icers on. They act as spoilers if left on. Turn them off on base leg.



Get on instruments—but quick!

7. Don't make steep turns, practice stalls or spins, land with power off, or try to climb too fast when ice has formed on the plane. Ice increases the stalling speed of an airplane because of increased weight and drag, as well as decreased lift.

8. Don't forget when flying under icing conditions that gas consumption is greater than normal, due to the additional power required to maintain flight.

9. Don't forget that turning on carburetor pre-heat or using alternate air intake, the latter before entering any weather where there is possibility of icing, may make all the difference as to whether you get through or not. Many pilots are woefully lacking in theoretical and practical knowledge on this subject. You can ice up even though you cannot see the moisture in the air.

10. If you can't control carburetor ice, *land* while you still have enough power to control the plane. *Maintain flying speed!*

G On Instruments—The records show that borderline instrument weather is almost as dangerous as the zero-zero kind. This apparently is due to the fact that non-instrument pilots often press on into this stuff until they lose ground contact, while qualified pilots wait too long before going on instruments.

Some instrument pilots evidently lack the will power necessary to shift immediately from contact to instruments when conditions demand. There are psychological factors involved in this emergency which are impossible to reproduce accurately in synthetic training. Unless you can shift instantly, without letting the element of surprise upset you, you are not a fully qualified instrument pilot.

It is good practice to refer to your instruments frequently while on "contact." Then if you should unexpectedly fly into some condition of reduced visibility, you are better able to shift to instrument flight immediately. It is much easier to maintain control of your plane on instruments while it is in normal flight than it is to recover from some unusual position on instruments.

After you have learned how to fly on instruments, then it is merely a matter of will power, self control and practice. When the time comes and you find yourself in instrument weather for the first time and with no safety pilot, don't get panicky. Relax, you know what to do. Your airplane doesn't change its flying characteristics when it is in a cloud, so it's up to you to make yourself fly the plane just the way you have been taught in instrument flight procedure.

Strike One!—The airplane acted sluggishly on take-off. At 100 feet altitude it started to mush in and the pilot made a forced landing in a semi-cleared area near the field. The plane turned over and received "strike" damage; the pilot got out with only minor abrasions.

Yes, it was Dilbert and he was quite elated about his reactions in this emergency. Quoth he, "Cool, calm and collected; that's me. Landed straight ahead, just like the book says. It was just tough luck that she nosed over."

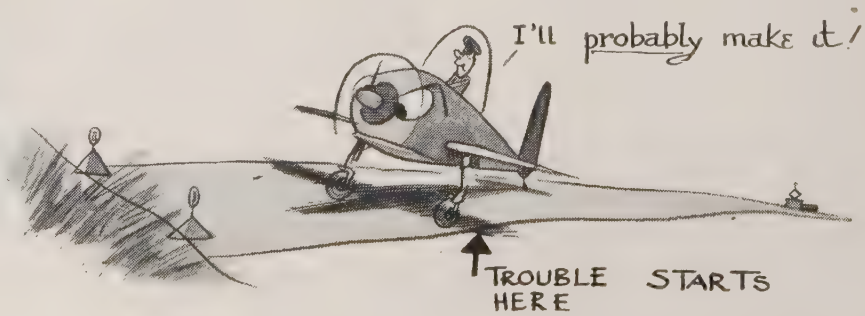
He was soon deflated, however, when the crash investigators pointed out that his take-off had been made with the propeller control handle not in the full forward position and with the mixture control midway between automatic lean and the idle cut-off position.

It shouldn't be expecting too much of this particular pilot never to take off again without first checking the position of all cockpit controls.

Use Full Runway—Here are a couple of brilliant examples of complete lack of judgment on the part of pilots:

Case 1—This pilot noted he was high and fast on his landing approach in a high-powered plane. Instead of going around again and making a proper approach, he tried to land. By sideslipping over the edge of the field and fish-tailing violently, he was able to touch his wheels down slightly past mid-field, but still at excess speed. His brakes failed to keep him from running off the end of the runway, where he groundlooped and nosed over.

Case 2—An instructor was late reporting to the line for a flight. In order to make up for lost time, he elected to take off from mid-field, instead of using the full runway. His haste must have impaired his technique, however, for he bungled his take-off and crashed into obstructions at the end of the field.



Flying Governor

(Continued from page 16)

he was awarded his pilot's ticket, Gov. Sigler was 52 years old.

Airmen consider him a skillful and cautious pilot who doesn't take chances. Sgt. Kenneth G. Templin, of the State Police, who usually accompanies him, said he never fails to make his cockpit check before a take-off. Control tower operators report that the governor always inquires about weather conditions at his destination and along his flight plan.

The governor himself feels he is safer in his airplane than in his automobile. He realizes the utility value of flying and he, probably more than any business executive, is rewarded with its dividends.

Above all, the governor believes the people of Michigan—the taxpayers—benefit from his flying ability. He appears before more groups and probably is known personally by more people than any other governor ever did in so short a time. All this knowledge has come to him quickly through the medium of flying.

From the cockpit of his plane, Gov. Sigler makes personal surveys of the flood conditions that have imperiled life, homes and property in the lower portion of Michigan in the Spring the past two years. He doesn't have to depend upon subordinates' reports to make his recommendations for flood control.

The same holds true when the State Highway Department seeks a solution to Michigan's highway congestion problem. From the air the governor has become a virtual "see all, know all." His information always is first hand, gained from a box-seat in the skies.

Stemming from the fact that their governor flies, Michigan pilots are reaping immeasurable benefits. Quick to note deficiencies, Gov. Sigler is equally swift in taking corrective action to improve flying conditions at the innumerable airports he visits.

Aviation throughout the United States is aware of the bolstering it receives from Michigan's No. 1 private pilot.

Perhaps on a flight the governor notes a landing light burned out at some Michigan airport. If it's burned out the next time he views it, he dispatches a letter suggesting corrective action or recommends that the Michigan Department of Aeronautics take the necessary steps to correct the hazard.

While the example given might seem trivial, it indicates the scope of his scrutiny and Gov. Sigler feels that only through observation of the minutest details can he properly evaluate a situation.

His keen interest in making flying safe was again illustrated recently on a visit to the airport at Houghton Lake. Not far off the end of one of the runways is a State Police Post. Its radio towers probe the air up to 175 feet, and constitute a menace to flyers using that runway.

Only through the fact that he himself flies was Gov. Sigler aware of the flying danger. Corrective measures are now under way.

There are dozens of other instances of the flying governor noting some need for improvement and these are reasons why Michigan leads the nation in the number of students taking flying lessons.

Gov. Sigler also is the reason for removing the political stigma from the State's Department of Aeronautics. Shortly after taking office, he cleaned house. Politicians went out on their ear and their posts were filled with men experienced in all phases of aviation in Michigan.

That he picked a representative body is evidenced by the esteem in which the Aeronautics Department is held throughout the nation.

In the little more than two years he has been a pilot, Gov. Sigler has amassed 1,200 hours in the air. But he wasn't satisfied with just being able to fly a plane during nice weather. To him an airplane was a machine that required a skillful operator in order to make it safe and valuable.

Despite his full schedule of daily appointments and other duties as governor, the chief executive found time to become a rated instrument pilot. He has chalked up near 100 hours in the Link trainer and about 50 more under the hood.

(Continued on page 42)

Flying Governor

(Continued from page 41)

In addition, he has many hours of actual instrument weather flying.

"I have recently obtained my instrument rating," Gov. Sigler stated in a letter to John P. Gaty, vice-president and general manager of the Beech Aircraft Corp., "and the more I have learned as the result of this training, the more respectful I have become of weather. While I have an instrument rating, I have made a solemn resolution with myself never to fly upon instruments except as an absolute necessity and, in addition, to keep in constant practice by at least two or three hours of Link Trainer time per month and hood hours sufficient to keep on top of the subject."

Sigler appreciates the value to flyers of weather information. On a flight in the northern part of Michigan he became aware that Sault Ste. Marie was the only point broadcasting weather information on a frequency a small plane could intercept.

An investigation began and the governor learned that Houghton and Grand Marais, in the Upper Peninsula, both were radioing weather reports for the benefit of Canadian air lines which pass over the region. The arrangement was all very proper, but it didn't benefit private pilots.

Out went a letter to the CAA in Washington. It wasn't long before the two stations were broadcasting on a radio range of the proper frequency.

Because of Gov. Sigler's acknowledged ability as a pilot, Republican leaders and his constituents in general have no fear for his safety when he is airborne. His family feels the same way.

His wife frequently flies with him, and the two vacationed in Florida and Arizona after journeying in the *Bonanza* with the governor at the controls. His two daughters often accompany him.

At Tucson, Arizona, the governor utilized his vacation to get some Link trainer time. He continues this training at Selfridge Air Force Base, Michigan, a short hop from the State Capitol, Lansing.

Because he is the only one of the 48 governors in the United States who has a license to fly, the Air Force has made him its only honorary member. As a result of this recognition, he is free to use the training facilities of the Air Force, and he does indeed.

While in Tucson he spent a great deal of time at the Davis-Monthan Air Force Base. When he wasn't in the Link trainer, he was aloft in a B-29.

Since he was inaugurated, Gov. Sigler has flown the length and breadth of the State encouraging aviation interest.

He has undertaken a personal project of getting the Michigan Legislature interested in aviation. He frequently flies home members of the legislative body, especially those living in the northern portion of the State.

Not only does he reduce the time he is away from his desk, but through flying he is able to visit all parts of the State with ease and frequency otherwise impossible.

As an example, and this is typical of his widespread flying, he flew on a Thursday to Cheboygan, near the top of the Lower Peninsula, to address a convention in the evening. He arose at 6 A. M. Friday and the fast cruising speed of his plane brought him to Lansing in time to be at his desk at the usual time in the morning. Shortly before noon the same day, he guided his ship to Bay City for another speech. At 4 P. M. he was in Caro and an hour later in Port Huron to appear at the annual Blue Water Festival.

He remained over night and Saturday morning winged his way to Birmingham to transact some business. Noon found him in Flint and in the late afternoon he was addressing a State American Legion Convention in Ishpeming, in the Upper Peninsula and hundreds of miles from his previous stop. The very same evening he talked to a group of politicians in Marquette and remained there for the night. Sunday morning he nosed his plane to Mackinac Island where he spent the day. Arising early Monday he headed for home and was at his desk at 8:30 A. M.

The pilot-Governor shuns special dress when at the controls. He wears his regular business garb and always presents the elegance of dress for which he is noted. His traveling luggage is always packed and he carries along a zippered plastic storage bag with several extra suits.

For the suppression of crime and as an aid to the efficiency of the Michigan State Police, Gov. Sigler equipped the law enforcement body with an airplane the same as the one he owns privately.

The craft is used extensively for manhunts, surveying traffic conditions, apprehension of pilots violating flying regulations, searching for lost flyers and even on mercy missions if necessary.

Gov. Sigler said that at the next meeting of the State Legislature he plans to ask the purchase of two more planes for the State Troopers. The Upper Peninsula of the State is 300 miles long, he points out, and it takes an inspecting officer two weeks to visit all the posts in this, the Eighth District, by automobile. With a plane, the time can be knocked down to two days.

The second plane would be assigned to the upper portion of the Lower Peninsula in the Seventh State Police District.

Lest he draw unjust criticism, Gov. Sigler is quick to point out that he pays for all the cost and maintenance of his private plane. Taxpayers' money is not touched. Dwaine Cotter, a mechanic employed by the Michigan Department of Aeronautics, is responsible for the plane's upkeep. He is paid by the governor for his work on the ship, done after his regular tour of duty.

Gov. Sigler's administration, through the Aeronautics Department, currently is jousting with the problem of locating a new airport for the benefit of Detroit. The current airdrome used is at Willow Run 30 miles from the heart of the city. This new field may even be located across the river from Detroit in Windsor, Ont., where a spot only a few minutes from downtown Detroit is available.

And again his interest in the small details was shown when, at Lansing's municipal Airport, he had benches installed with a clear view of the runways and tax apron. Now the public can relax and enjoy the flight activity.

So this flight activity will function smoothly, he also ordered a huge airway map installed in a small operations office at the Lansing airport. Now airmen don't have to fit together the four conventional sectional maps that are necessary to blanket the State of Michigan.

From this central map, flyers can quickly obtain compass headings and distance to plot their course. The map covers a radius of about 1,000 miles from Lansing.

Since he took office, hundreds of towns have been marked for the edification of airmen, and the program is continuing.

There is evidence his exploits are succeeding in getting Michigan and the world to perk up and note the air age. Recently when deposed King Michael of Roumania visited Detroit, Gov. Sigler caused alarming furor among the personal and United States Bureau of Investigation bodyguard of the monarch.

The youthful ex-King had disappeared. But he soon was located, safely aloft with Gov. Sigler on an aerial sight-seeing tour of the Motor City.

Mallard...

(Continued from page 36)

50 miles to over 1,300 miles, depending n loading, and with auxiliary tanks will y 1,700 miles. The airframe extends 66 eet, eight inches from wingtip to wing- p, and 48 feet, four inches from nose tail. The top of the tail is 18 feet, ine inches high on land, which allows ne plane to be moved easily into any angar with standard 20-foot doors.

In meeting or exceeding the operational nd design strength requirements of Part 4a of the CAA's strict requirements in ne Transport Category, Grumman tailored ne *Mallard* to give maximum performance nder all types of operating conditions ith varied loads. In view of the *Mal- rd's* operating performance and range everal owners have made transatlantic ights to Londan and Paris easily) its eight and size are quite reasonable.

The *Mallard* is powered by two direct- rive Pratt & Whitney *Wasp* (R-1340- 3H1) engines of 600 hp each, swinging ight-foot, seven-inch Hamilton Standard ydromatic full-feathering three-bladed ropellers. The engine type was chosen n the basis of its long service experi- nce because of the necessity for possible maintenance in remote corners of the orld, while the propeller fills the re- uirements of high water-clearance with w thrust line and maximum efficiency r single-engine operation and cruise.

The hull is compartmented from front to rear into: a bow compartment with top hatch, the pilot's office, the passenger cabin, a complete lavatory, and in the tail section, a large baggage compartment.

The center of the passenger cabin is directly under the wing beam so that any number of passengers may be seated at any position without exceeding the CG limits of the airplane. The cabin interior is moderately separated into two sections by the shallow wheel pockets in the cabin walls, but in effect, it allows a realistic separation into a four seat rear compartment and a forward compartment allowing several combinations of conventional seats or three-seat lounges, all of which are readily removable or interchangeable.

One of the difficulties in mooring the amphibian at a water landing is presented by the big outer wing floats which also act as auxiliary fuel tanks. Grumman has always explored the possibility of incorporating retractable wing floats on each of its amphibian designs, but (regretfully) the company has found that the moderate increase in speed and range is more than offset by the decrease in payload and increase in cost. But despite the "reach" of the floats for every object that makes moving a big plane a ticklish project in a tight space, expert handling and experience make it a comparatively simple matter, except, as previously noted, at city water landings that have never kept up with amphibian technology.

Without going into the techniques of construction which gave the *Mallard* its high hull efficiency and airframe strength to qualify for a scheduled transport rating, it might be noted that the life span of amphibians before obsolescence tends to be longer than landplanes and the *Mallard* design permits, according to Grumman sound economical competition with landplanes of comparable size.

It is also definitely worthy of note to mention that the airplane's price of approximately $132,000, includes an over-all item of $7,200, at current list, with 224 pounds of radio equipment. The radio lineup, all Bendix units, includes one MN-31 Automatic Direction Finder, one MN-26 Range Receiver, one TA-17 50 watt transmitter with four crystal controlled channels, and one MN-53 Marker Beacon Receiver.

On the basis of its operational requirements, the tests it had to pass, and according to the successful uses to which its owners have applied it, the *Mallard* scores high on all-around performance. Grumman rightly feels that it is manufacturing quite a hunk of airplane, but then other manufacturers have felt the same about their projects in every category from personal to giant transport. Grumman's success seems to be based on the fact that it has explored a critical market which can well afford to pay the price for the utility, performance, safety and ease of operation which the *Mallard* supplies.

Operating over practically every land and water area in the world in all types of work, the *Mallard* appears to be a well brought-up, successful postwar baby, with a wide service maturity in clear sight.

If We Fight

(Continued from page 38)

tainly involve is *anti-submarine warfare.*

In World War II the total Atlantic and Pacific overseas transportation job for the Army, Navy and Merchant Marine reached the staggering figures of 33 billion passenger miles and 676 billion long ton miles of cargo.

These are the targets of the submarine. Moreover, to all the former capabilities of this menacing creature as a commerce destroyer has been added the ability to launch guided airborne missiles. Most definately, the submarine is a weapon to be reckoned with as never before and its destruction promises to be one of the major operational aspects of the next war.

So much for some of the major operational aspects likely to appear in a fast changing variety of combinations in a war of the near future. Throughout a wide diversity of situations, the Navy as a whole and Naval Aviation in particular may be expected to play a vital role.

Naval Air power is the heart of the Navy, but to project the full impact of that potent force against the enemy, over a vast area of the globe whenever and wherever required, necessitates the creation and use of a highly specialized vessel—the aircraft carrier.

With a flight deck some 900 feet long, complete with catapults and arresting gear, the carrier provides every facility of a complete air base. The carrier supplies all the operational needs of the embarked air groups—fuel storage, facilities for rearming, for service and maintenance, quarters for personnel anti-aircraft defense, communications and control.

To capitalize fully upon the potentialities of the carrier it must be assembled with other carriers and support vessels into tactical organizations, tailored, balanced and appropriate to the task to be performed. This is the Carrier Task Force.

Taken together—air groups, carriers and supporting ships—the fast Carrier Task Force is an air striking force of tremendous power and unique versatility. Its most outstanding characteristic is mobility.

Mobility promotes *economy of force* and provides means for the establishment of a state of instant *readiness* in selected offshore parts of the globe — a sort of global flank security vital to our national interests.

But overlapping any of these military virtues, mobility of the Carrier Task Force provides one other advantage of transcendent importance — namely, *range* in striking power of its embarked aircraft.

The essence of air power is the ability to control and utilize the air for whatever purpose and in whatever area required, while denying this to the enemy.

As a corrollary it requires the ability to bring enough of the right type of weapons into effective action at the right time and at the needed geographical location.

It is this problem which points up the unique value of carrier mobility. To the Carrier Task Force, the sea is not a barrier but a highway to the shores of island continents all over the world; a highway which enables it to put into the air in strategically critical parts of the globe, a tactical air force of higher performance than could fly into those same critical locations from more remote shore bases. This free transportation to the combat area underlies a general principal of great importance — that when you mount any weapon on a Naval ship, you increase the effective range of that weapon by some part of the cruising radius of the ship itself. In other words 800 miles of radius built into the tanks of the airplane can be supplemented by perhaps 3000 miles of radius in the form of transportation in kind, supplied by the carrier from which it operates.

Range extension, then, is one of the major rewards generated by the mobility of the Carrier Task Force.

Fundamental to its usefulness, the Carrier Task Force has *sea-keeping endurance.* This ability to stay on the job for extended periods springs in part from basically correct ship design and in part from the ability to refuel and re-arm at sea. As a strictly normal procedure, replenishment of every kind—material, personnel and air groups—is accomplished at sea, completely adequate to keep the task force in fully operational status for long periods.

Closely related to the general question of ability to stay on the job is the matter of *resistance of carriers* to enemy attack. The strength of the Carrier Task Force in self-defense rests in three elements. It protects itself first and foremost with its own aircraft. The use of jet aircraft of improved and specialized types together with advances in the science of radar detection promise a continuing increase in defensive strength. Massive concentration of anti-aircraft fire provided by the carriers and their screens is a second defensive element. And finally the power of movement, the ability to be here today and 600 miles distant 24 hours hence, to take evasive action at high speed, or to disperse a formation in a matter of minutes, are protective maneuvers so effective as to render a task force an unprofitable target even for an atomic bomb.

In the last war we operated 110 aircraft carriers of all types for a total of some 940 months in combat areas and lost 11; statistically, one for each 85 months of exposure to enemy attack. Analytically the record was even better. After the incorporation of mechanical improvements and the use of new tactical doctrines resulting from experience gained during the first year of the war, fast carrier task forces met everything the enemy had to offer and lost only one large carrier during the remainder of the war.

In its *offensive* role, the effectiveness of the Carrier Task Force arises, as we have previously remarked, from its ability to exploit the combined range, power and mobility of ship and airplane.

The special operational problems of the Anti-Submarine Carrier Task Force are somewhat different. You do not destroy a modern submarine as you would a surface vessel, with a single triumphant sweep. On the contrary, the schnorkeling submarine with its additional capabilities of deep submergence and high submerged speeds presents a task which depends funda-

(Continued on page 48)

Bush Flyers

(Continued from page 19)

.45 automatic, they scouted the enemy, located troop assembly points, hidden machine gun nests, camouflaged tanks, and artillery concentrations. They then aided their own troops in penetrating and smashing the enemy defenses.

Merely hedge-hopping, these men were vulnerable to well-placed revolver or rifle fire. In areas inaccessible to modern transportation or where communication lines were disrupted, these flyers coordinated between units and their higher commands. At times they flew intelligence operators across and behind enemy lines in order to keep intelligence channels open.

Shortly after the cessation of hostilities, most of the liaison squadrons were deactivated. It soon became evident to the high command, however, that better coordination in communications and transportation was needed if these services were to function smoothly and economically. They immediately reactivated a small number of these liaison squadrons.

The 158th Liaison Squadron of the occupational Fifth Air Force is commanded by Captain B. B. Walters. This organization was reactivated in October of 1947 to service all of Japan. Its importance to the air and ground functions of the occupational forces was immediately felt. So swiftly did they go about the business of coordinating transportation and communications between various military units and departments strung from the northern tip of Hokkaido to the southern end of Kyushu that commendations have been received from privates and generals alike.

One day spent on the maintenance line, or in the air, with this organization is a pleasant experience. This is strictly a working outfit. They have an unusual amount of pride in themselves, their outfit, and their job. The quiet and good-natured manner in which this group of men functions as a well-balanced team is inspiring. There is little bluster when the going gets rough. The nonchalant, unassuming manner in which they swing from one assignment to another is amazing.

In the morning, all may be flying routine runs and then find that in the afternoon they must fly a stretcher case, make a land search, drop informational leaflets for military government, do special courier work, deliver a delayed payroll, or fly an important personage to a conference.

During the war, commendations, letters of appreciation and citations were presented to both flying sergeants and ground personnel who tended the baby "wasps." Scores of incidents where individual resourcefulness, courage, and tact were displayed by such flyers have gone untold; others have become legend in the annals of flying men.

The men who make up the 158th Liaison Squadron are fashioned from the same cloth as these wartime flying sergeants. Some of them have seen service and been decorated for service in various theaters during the last war. Their woof—they like to fly; their warp—they can and do fly; their slogan—"Service to Duty First."

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(Continued on page 48)

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(Continued from page 47)

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If We Fight

(Continued from page 44)

mentally upon continuity of effort — dogged and persistent teamwork between surface vessels and highly instrumented aircraft, the latter, in turn, so closely supported by an aircraft carrier as to insure uninterrupted and unrelenting on-the-spot effort.

Without spelling out all the tasks for which the services of Carrier Task Forces may prove indispensible, its role might be summarized in two words—interception and attack.

In the first role and in addition to anti-submarine warfare, the Carrier Task Force—by surveillance and by striking power far off shore—can prevent the movement of enemy forces intent on establishing the interim bases which might provide the staging points for attack on our homeland—or operating without submarines it can detect and intercept enemy aircraft.

In a larger sphere — its offensive capabilities fall into three categories:

1) Those concerned with the dislodgment of enemy forces or the seizure of advanced bases—or those comprised under the term of amphibious operations.

2) Precision strikes by carrier-based bombers supported by accompanying escort fighters against vital and specific elements of the enemy's target system.

3) Concentrated fighter sweeps to destroy the enemy's air strength at its source.

These capabilities are, of course, among the inescapable minimum responsibilities expected of any air force. The important point is not that sea-based air power can execute these tasks, but rather that it can perform these tasks over a wide area of the globe and that they can be initiated beginning with the earliest moments of war, before shore bases of comparable proximity to the enemy could be readied.

This brings us to the next point—namely, the influence of the environment created by air operations from mobile, sea-going bases upon the aircraft employed.

The initial phase of the over-all problem is the *environment created by the carrier* itself. The merit of an aircraft carrier — which forms the springboard from which naval aviation strikes — is measured by its ability to operate the maximum number of aircraft with maximum facility and dependability. Accordingly, the environmental characteristics of the carrier-based plane must be such that is can be accommodated afloat, not only without sacrifice of its own performance in the air, but also with minimum interference to the over-all effectiveness of the carrier. The problem springs obviously from the extreme limitations on space aboard a carrier, as contrasted with the generous acres of a shore base. As a result, a fundamental objective in every development project for carrier aircraft is the creation of a design which will permit a scientific and operationally practical concentration of the maximum number of aircraft in a minimum of precious square feet of deck area.

Extreme awareness of the importance of compactness in design and the significance of key dimensions is, however, only the beginning. Efficient operation demands that the airplane be ready for re-launching at the earliest possible instant after landing. This entails special arrangements for securing and for handling aircraft on a pitching deck; for rapid fueling and re-arming; for last minute checks and line maintenance; for engine run-up, both jet and propeller; and for refueling.

The emphasis on the development of special airplane-design characteristics to overcome the limitations of space on board a carrier becomes of special importance in the landing and take-off phases of operations at sea. First is the matter of the special aerodynamic features of design and performance which promote short take-offs and which provide the precision of control in low-speed flight required for accurate landings in the arresting gear of a pitching ship, or for a safe "Wave-off" during the last split-second of the approach phase.

Second, is the requirement for built-in strength and ruggedness, adequate to insure that every part of the aircraft shall withstand the shock of continuous carrier operation—and with every structural element precisely proportioned to minimize impairment of performance in the air.

Solution of the problems presented by the environment of operation on board a carrier is unfortunately only the initial or preliminary aspect of the over-all environmental problem—only the introduction to a far more exacting regime which the airplane must encounter when it lifts off the deck and climbs to the *environment imposed by combat operations.* The Carrier Task Force undertakes to deliver the airplane, with fuel tanks full and with the pilot fresh and rested, to almost any quarter of the globe accessible by sea. It spares the pilot the fatigue and the penalties on performance incidental to flying into the theatre of action from remote bases. Once the carrier pilot is airborne, however, he is strictly on his own, and the *performance* of carrier-based aircraft thereafter must in every way match or surpass that of their adversaries.

The two aspects of environment which we have discussed up to this point—carrier environment and the environment of the combat zone—represent external conditions imposed upon the airplane.

The third and final aspect is the *environment which the airplane must supply for the human pilot.* This aspect the airplane designer views with far less satisfaction, primarily because of his inability to effect improvements in the human pilot in the same manner that he has improved the airplane. Correctly enough, the airplane designer points out that the human pilot weighs just as much now as he ever did, takes up just as much precious space in the airplane, and will die if hit on the head with the same size rock which would have killed a man a thousand years ago—maybe smaller. Man doesn't improve the way the airplane does, and worse than that he shows little promise of doing so. In addition, he complains if he is too hot or too cold, and passes out if the airplane maneuvers too violently, or if you fail to provide him with oxygen. He gets lost. He gets tired and loses his ability to concentrate and he has nowhere near the

sensitivity and repidity and precision of response which the airplane designers say are going to be necessary in the future.

So careful consideration has to be given to his frailties and to the creation of devices for facilitating the pilot's ability to cope with his heavy responsibilities in high-sped flight and all-weather operation of the future.

Very briefly, three categories of these devices are required in an airplane. The first category furnishes the human pilot with an environment in which he can live —that is to say, a cockpit which provides pilot tolerable conditions of atmosphere and protections against physical injury from accelerations.

Two factors are involved in the matter of pilot's atmosphere—temperature and pressure. As to the former, we used to be concerned primarily with the matter of keeping the pilot warm against the sub-zero temperatures of the higher altitudes. Now, however, we are equally concerned about keeping him cool against the various heat sources to which he is subjected. Aerodynamic heating from high-speed flight, heat from jet engines, heat from solar radiation—from these and a variety of others sources, comes the necessity for replacing our former simple cockpit heating system with a complete cockpit air-conditioning system, to provide either cooling or heating.

Relatively simple and reliable oxygen apparatus will take care of the pilot's requirements up to about 40,000 ft. Above that the altitude pressurized cockpits are required. This is not the complete answer to the problem of cockpit atmosphere because of the hazard of explosive decompression—a phenomenon which results from sudden pressure drops such as would occur if the cockpit enclosure were lost or shattered by gun fire. Explosive decompression can cause serious injury to the pilot and can be kept in hand only by placing strict limits upon the pressure differential allowed in flight.

The remaining major device in this category is the anti-G suit to delay the onset of blackout resulting from the effect of high radial accelerations on the pilot's circulatory system.

The next category of aids to help the human pilot keep pace with his responsibilities is the host of vital components which relate to automatic control and to an extension of human perception.

Far beyond the simpler concepts of the past, the over-all objects of this new automatism is to supplement and, in many tasks, replace human perception, judgment, and response in the mechanics of flight by the multiplied capabilities, sensitivity and precision of electronic apparatus, in order that a highly complex flying machine may be directed by simple over-all commands—thus permitting safe flights which, otherwise, would be beyond the capabilities of human pilots because of distortions of the geometry of space and time created by this new regime of speed.

The third and final category of devices under development to aid the human pilot deals with the matter of pilot escape from high-speed aircraft in flight in an emergency. To our present thinking, conventional methods of bail-out for safe escape in an emergency are limited to speeds below 300 mph. Solution of the problem of escape at higher speeds resolves itself into providing positive mechanical means for separating the pilot from the airplane in an emergency, and at the same time protecting him against damaging forces.

We have divided our attack upon this problem into two phases: In the first method, the pilot and his seat are catapulted upwards on vertical guide rails and out through the upper side of the cockpit. The seat and pilot are ejected high enough above the fuselage to clear the tail of the airplane, where the pilot releases his seat and descends by means of his regular parachute. Although development is not complete, extensive ground and flight tests show great promise.

For speeds above 500 mph a program is in progress for development of the so-called capsule-type escape. In this scheme, the forward portion of the airplane containing the pilot is detached from the airplane and the pilot subsequently releases himself from the nose section and descends by parachute.

Thus far we have outlined the role of sea-air power in the over-all program of national defense and suggested the very vital contribution which the Navy can make through carrier-based aviation.

No one emphasizes more strongly than the Navy, that national security cannot be provided by a single weapon. In the unhappy event that war cannot be prevented, our expectation of victory is built, on unification—but unification in the broadest national sense, which will give full understanding and recognition to the integrated responsibilities of all aspects of air, sea, and land, and which will demand and utilize the utmost in effective co-operation, not only from the military but from every element in our national life.

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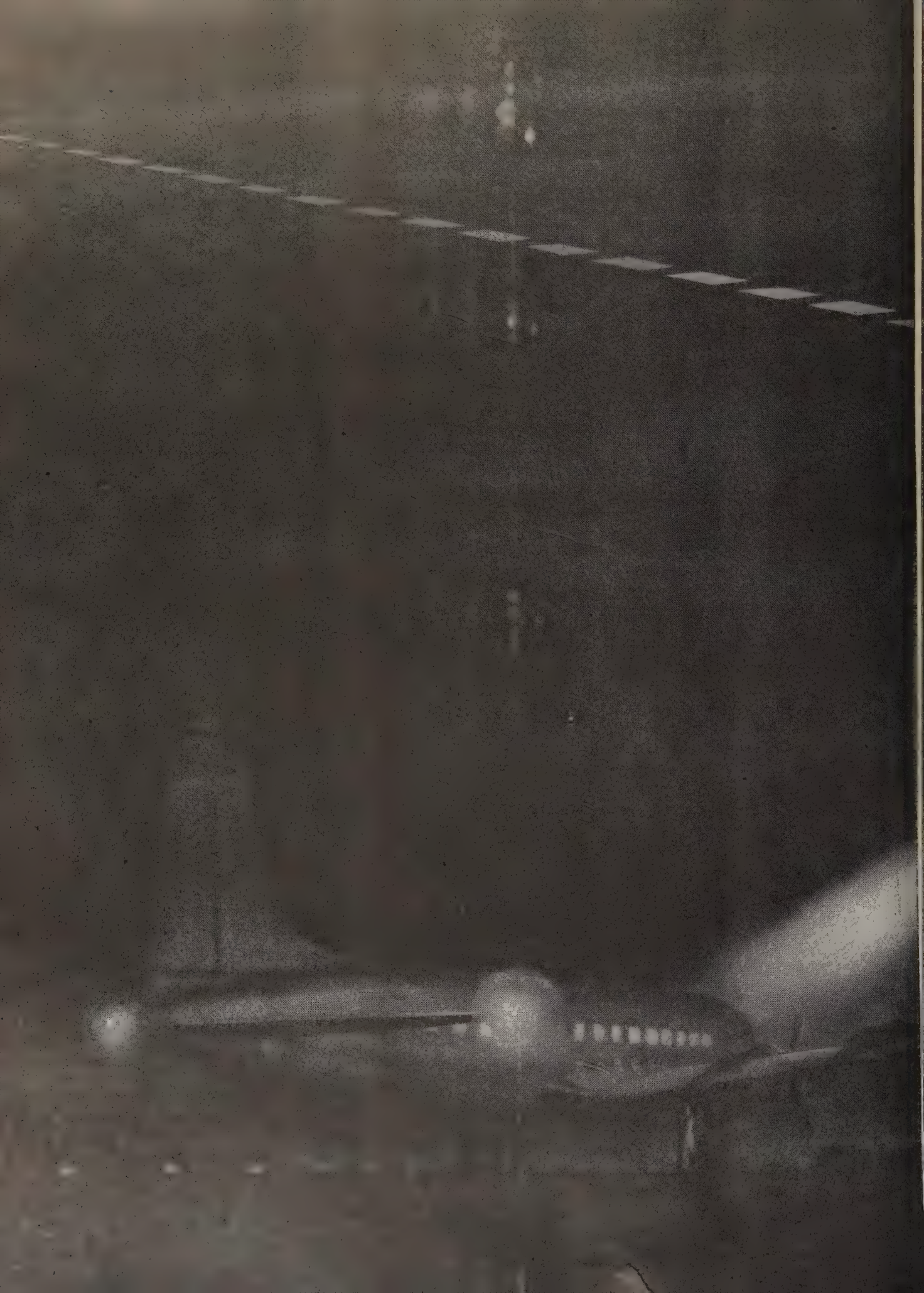

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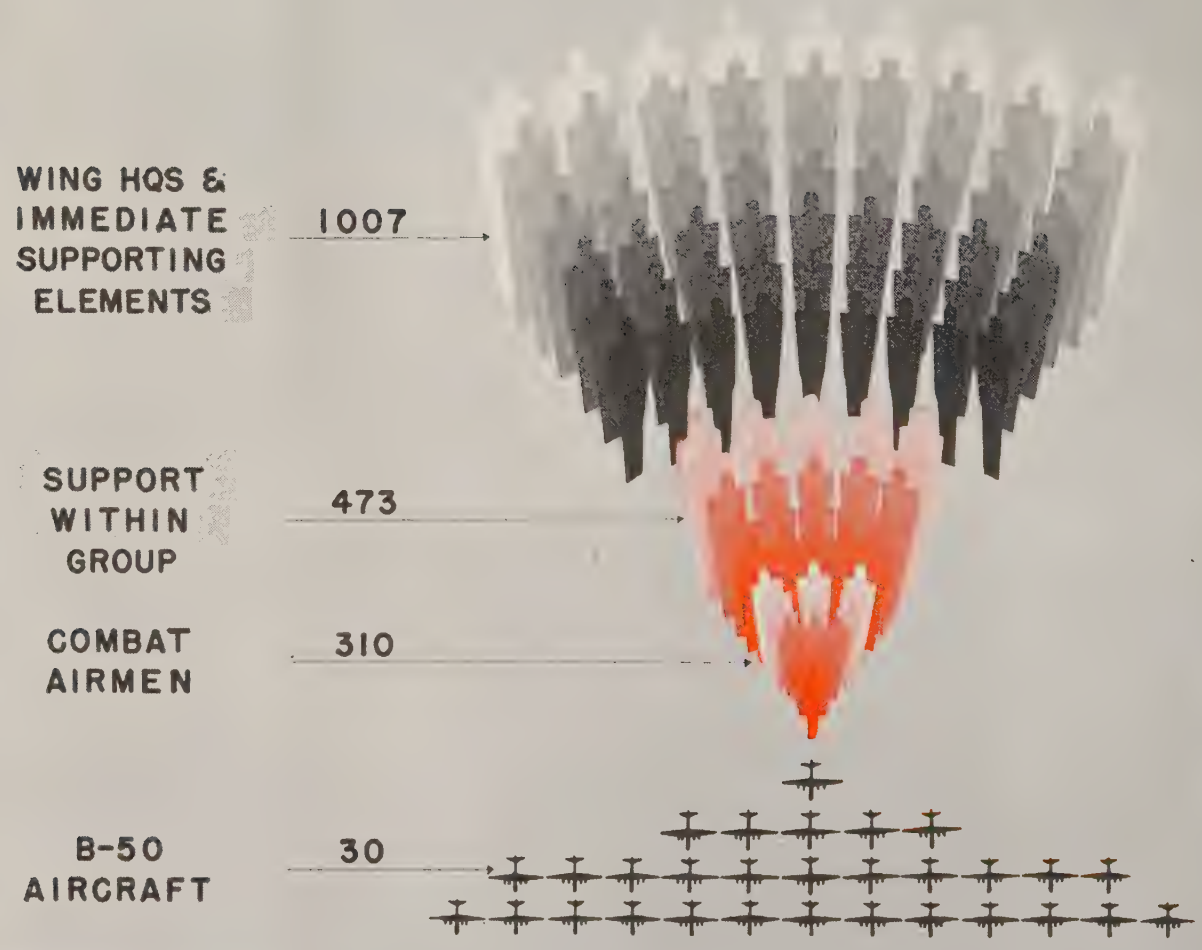

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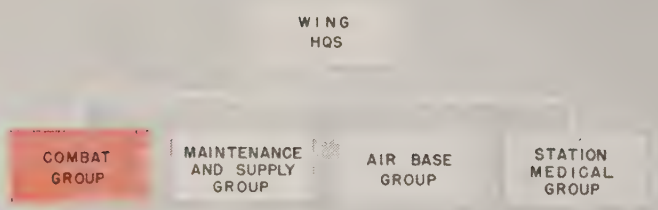

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The Air-Force-In-Being

THE Air Force visualizes and anticipates that any future conflict will include an air war which, with modern air weapons, may well be decisive. Adequate air-power-in-being is a powerful deterrent to aggression. If it fails as a deterrent, it is certainly insurance against defeat. The primary strategic consideration of the United States Air Force is, therefore, the quantity and quality of the air power available on M-Day. This single factor will have a vital influence on other strategic considerations and will determine the course and duration of any future war.

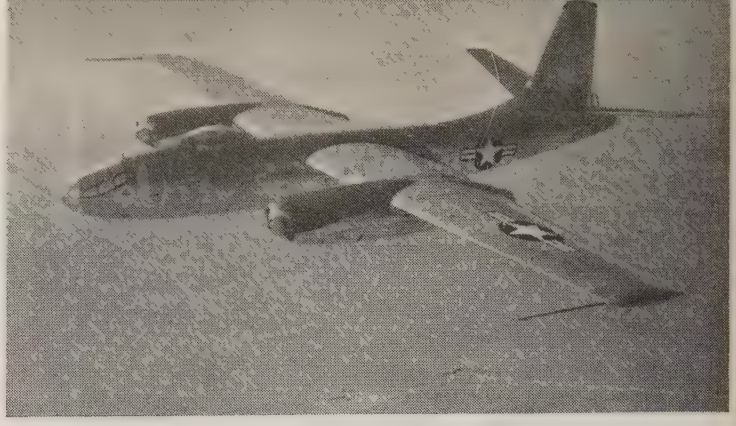
Several boards of experienced officers, working independently and analyzing the many factors involved in determining force requirements, evolved shortly after V-J Day the 70-Group Program as the goal of the peace-time Air Force. The term "70-Group Program" is primarily a descriptive one representing the minimum tactical and strategic forces required for immediate employment in the event of hostilities.

This minimum force has been determined to be 70 combat groups and 22 specialized squadrons, plus supporting organizations. It must be supplemented by a ready reserve of non-regular civilian components of the types and numbers that will round out and supplement a balanced Air Force. Present thinking indicates that the civilian components should include 27 National Guard groups and 34 groups of Air Reserve. The requirements for a 70-Group Air Force have been carefully examined and verified both by the President's Air Policy Commission and by the Congressional Aviation Policy Board. It cannot be overemphasized that this is the minimum force that can be kept in being without jeopardizing the security of the United States.

The Air-Force-in-Being includes the following types of units:

1. Long-range bombardment to strike at the vital heart of an aggressor.
2. Tactical bombardment for the isolation and close support of the surface battle area.
3. Day and all-weather fighters to defend bases, escort bombing missions, attack targets of opportunity, support surface forces, and assist in U. S. air defense.
4. Long-range reconnaissance to scout enemy installations, locate targets; photograph and map terrain.

NEW TRANSPORT is the C-99, a six-engine pusher-type ship that carries 400 troops or 100,000 lbs of cargo



JET BOMBER for the new Air Force is the North American B-45. It carries 10-ton bomb load at over 480 mph

5. Troop carriers for airborne operations and evacuation of casualties.
6. Tactical reconnaissance to exploit the employment of surface forces and tactical air forces.
7. Miscellaneous types for service, weather, rescue, and liaison.

Air Force personnel needs have been redefined in terms of the situation as it is now seen. The minimum force necessary to carry out the missions legally charged to the Air Force has been recomputed as 502,000 plus any increases that future transfers of functions from the Army to the Air Force may require.

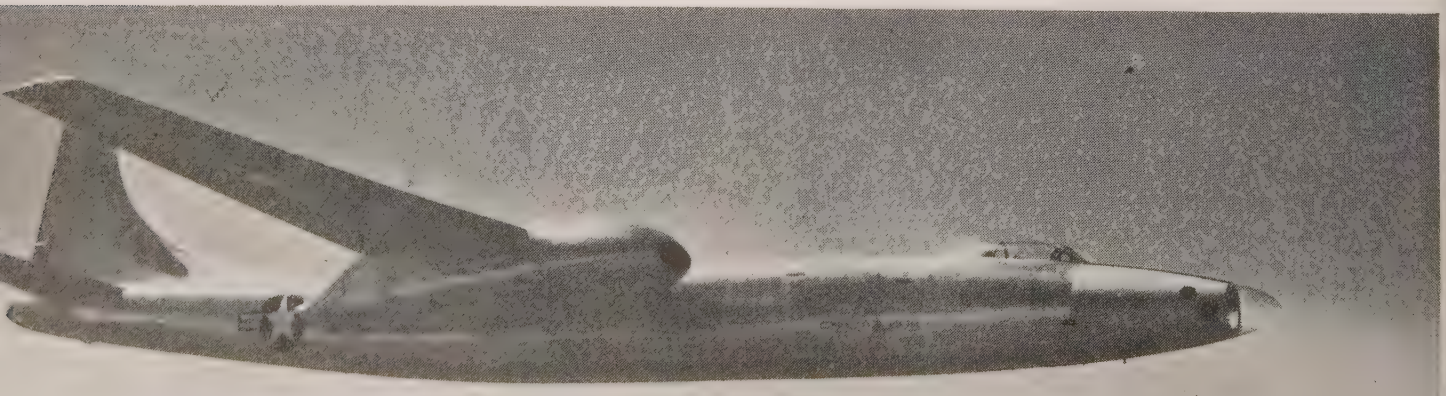
Research and Development

The period from V-J Day to the present has been highlighted by the development of many new and previously untested features in aircraft design. Some were natural developments of already proved designs. Others, and by far the majority, were dictated by the coming of jet and rocket power, and the realization that with such power available the achievement of transonic and supersonic speeds was a definite possibility. Examples of these design features are the swept-back wing, the thin wing, and the streamlined, low-drag fuselage.

The increasing demand for better performance, higher altitudes, and greater speeds in military aircraft has necessitated exploration into these new and radical designs for airfoils and airframes. In attempting to penetrate the so-called sonic barrier, aircraft designers are carefully investigating the characteristics of a swept-wing configuration. The Air Force has developed both fighters and bombers embodying this principle and is now gathering extensive flight data. Knowledge gained from experimental flights is expected to open new possibilities in high subsonic and supersonic ranges.

As speeds and ranges of our combat aircraft are steadily increased, new and challenging problems are continually being created. A major problem is the reduction of drag through the elimination of such protuberances as radio and radar antennas, turrets, and guns, so that the greatest efficiency possible may be obtained from the power of existing engines. Another requirement is adequate crew comfort and safety. Recent Air Force combat airplanes are designed for pressurized flight at high altitude, eliminating for the most part the use of uncomfortable and fatiguing oxygen masks. In addition, high-speed jet fighters and bombers are being designed for the explosive ejection of all crew members to insure escape from fast-moving aircraft if bail-out becomes necessary.

BOMBER in the so-called "light" class is the XB-46. The ship's jet engines are arranged in pairs in single nacelles



LOCKHEED F-80 will remain one of the AF's jet fighters for next year or two. Operational units are in Alaska

TWIN MUSTANG, powered by reciprocating engines, eventually will be replaced by the faster jet fighter planes

Research and development has been conducted primarily in connection with different types of aircraft, with the following results:

Bombers: The trend in bombardment aircraft is to establish three basic types: light, medium, and heavy. The light bomber will be a very fast aircraft capable of participating in cooperative missions with ground troops and designed to operate at short ranges from forward bases. The medium bomber will be the "work-horse" weapon, operating at intermediate ranges. The heavy bomber will be designed for strategic missions well within enemy territory and, therefore, will require extremely long range.

Present bombardment units are equipped for the most part with the same types of aircraft that were used in the latter period of the war. Wartime concentration on the production of these types resulted in a delay in the development of jet bombers, and it was consequently not until late 1946 that the first test jet bomber took to the air. Until such time as jet bombers can afford the United States adequate coverage of vital world targets, piston-engined aircraft will supply the long-range, striking force.

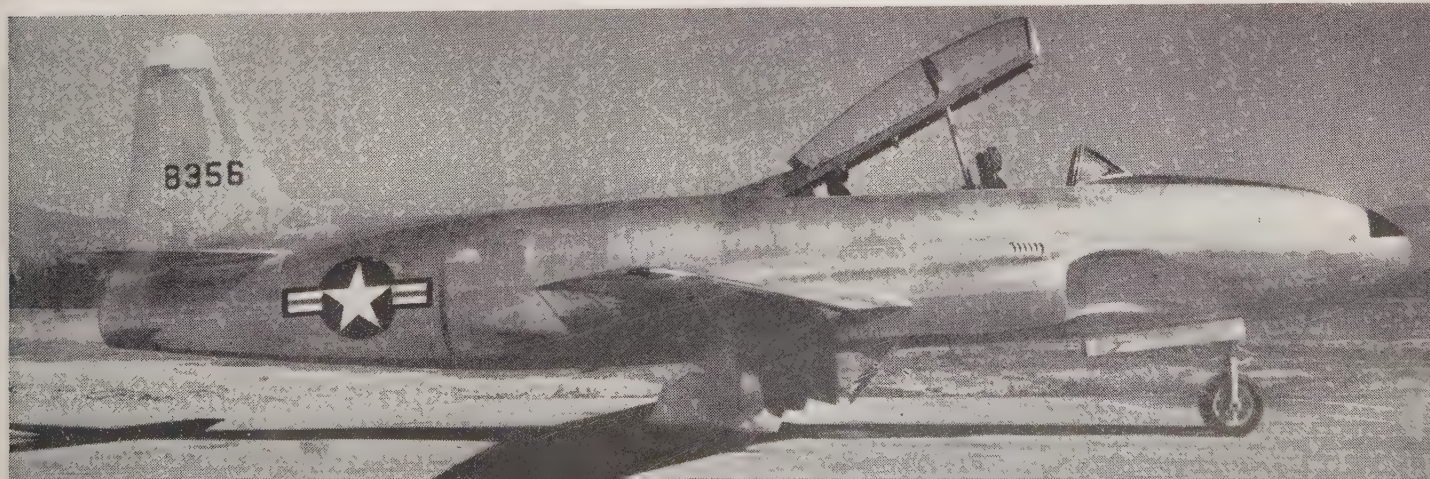
One of these will be the wartime B-29, currently in operation. Another will be the B-50, an advanced design of the B-29 now beginning to flow from the production line to Air Force bombardment groups. It is expected that through subsequent refinements the B-50 will reach its ultimate development in 1950. Because of the implication inherent in the new global concept of air power, both the B-50 and the B-29 will eventually be classified as medium bombers.

The third principal component of the bombardment force for the next few years will be the B-36, the largest and longest-range bomber yet built. Production models of this airplane are now coming off the assembly line and will soon be assigned to combat groups. The six-engined, pusher-type B-36 has a maximum bomb capacity of over 36 tons.

Looking farther into the future, the development of jet aircraft in the long-range, strategic bombardment role will necessitate the vigorous flight testing of early models to yield the answers to many tactical and operating questions. Probably the major unsolved problem faced to date is whether or not the range limitation imposed by a jet-engine's normally high rate of fuel consumption can be extended to meet strategic requirements. This question is being answered to the increasing satisfaction of Air Force engineers through engine refinements and improvements in design and operating techniques.

A few medium jet bombers have been built since the end of the war for experimental and

TRAINER for jet air force is this two-place version of Lockheed F-80. Official AF designation for trainer is TF-80C



GIANT B-36, called world's largest bomber, carries normal fuel supply of 21,116 gallons; has a 10,000-mile range

test purposes. The YB-49 *Jet Wing,* (a medium bomber) powered by eight jet engines, is currently the largest jet bomber in existence. The YB-49 has no fuselage and is based on design features introduced several years ago in the conventionally propelled experimental XB-35 *Flying Wing.*

Jet development has progressed further in connection with light, high-performance bombers for use in support of ground operations than it has with long-range bombardment aircraft. Light jet bombers, needed to lessen the advantage of jet-powered interceptors, are now under development and can be expected to replace the conventional types wherever possible within the next few years. The B-45 is already in production as a replacement for the A-26, now used in light bombardment units. Combat units will begin receiving this high-speed jet bomber in the latter part of 1948. Several other experimental light jet bombers, including the XB-46, the XB-47, and the XB-48, have been produced and are now being test flown. An unusual and valuable feature of the XB-47 is the extra take-off and emergency power available from its 18 Jato (jet assisted take-off) units along the after part of the fuselage.

Fighters: New military characteristics for four distinct types of fighters—penetration, interceptor, parasite, and all-weather—have been established. The penetration fighter will be used for operations against enemy aircraft and ground targets deep within enemy territory. The interceptor fighter will be a local defense weapon capable of providing aerial defense against enemy bombers and such missiles as may come within its range and capabilities. It will be characterized by an extremely high rate of climb, high speed, and short endurance. The parasite fighter, a new approach to the defense of the very long-range bomber, is to be carried in one of the bomb bays of the parent plane and released in the vicinity of the target to perform its mission. The all-weather fighter will be designed for operation during inclement weather and at night through the employment of automatic gun-laying equipment and radio and radar navigational aids.

The Air Force has not yet developed aircraft to fit all these categories. Since V-J Day two new types of jet fighters have made their appearance in tactical units, the F-80 and the F-84, both developed during the war years but not produced for operational use until later. These aircraft, together with the F-86, now in production, will make up most of the fighter force for the next year and a half. The F-86 incorporates the swept-wing principle and is equipped with a pressurized cabin and pilot-ejection seat. It will probably be with operational units by the middle of 1948. These aircraft will eventually be replaced by new fighters of superior performance developed to conform to the military characteristic of the penetration, all-weather, and interceptor categories.

Helicopters: By the close of the war the rotary wing aircraft had been established as a serviceable and useful vehicle for rescue, supply, and liaison. Under development at present are large transport-type helicopters with a capacity ap-

proaching that of the twin-engine fixed-wing transport of the war. It is expected that these large helicopters will simplify the transport of troops and cargo to or from small restricted areas.

Liason aircraft: Two new specialized fixed-wing liaison aircraft have been developed, flown, and are now being service tested, one for the Air Force and one for the Army. The Army Field Forces, the principal users of liaison aircraft, have had a number of commercial "off-the-shelf" aircraft procured for them to satisfy their interim needs. The versatility and suitability of these commercially developed lightplanes in peacetime tactical operations has so far met minimum requirements, and it is expected that their procurement will continue.

Cargo aircraft: Three long-range heavy transports are under development for use by the Military Air Transport Service, and one has reached production stage to satisfy the ever-present needs for increased payloads and ranges. As a possible replacement for the glider, the Air Force has awarded a contract for the procurement of a light, commercially developed transport of unusual design and excellent performance to be engineered to meet the requirements for a rescue aircraft and an assault transport.

Gliders: The combat glider, a development of the last war, has undergone great changes. New all-metal designs carry greater loads and give the crew and passengers increased protection. The feasibility of replacing gliders with powered assault transport aircraft is to be thoroughly investigated in the near future.

Reconnaissance: Since the end of the war, the practice of modifying existing types to meet reconnaissance requirements has been changed to permit the consideration of all new types of aircraft for reconnaissance purposes early in their design stages. This means that an aircraft selected for reconnaissance use may now be modified during fabrication and assembly in order to realize its maximum reconnaissance potentialities. Among new types being studied are aircraft of flying wing design.

The modernization of Air Force reconnaissance units since demobilization has been slow. Strategic reconnaissance and mapping squadrons are presently equipped with C-45, B-17, and B-29 types that are rapidly becoming obselete. Although no suitable new aircraft will be available within the immediate future, the policy outlined above will permit modernization within the next two to five years.

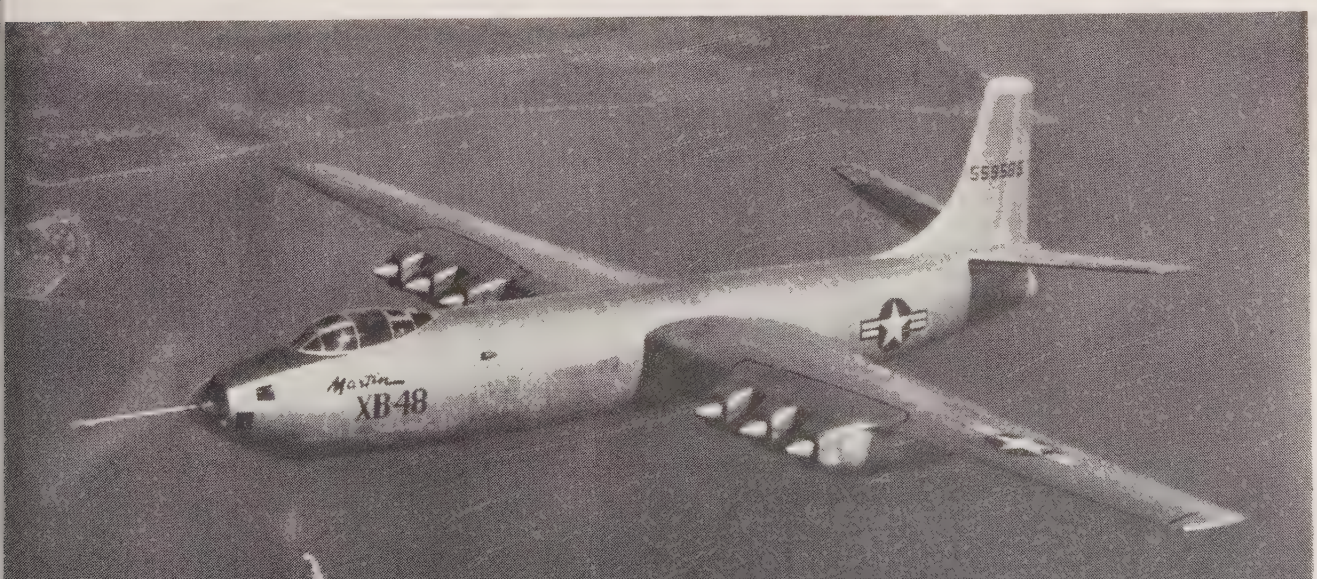
Guided Missiles

In March, 1945, a long-term guided missiles research and development program was initiated to provide the United States with advanced types of guided missiles at the earliest possible date. Work began with a thorough review of fundamental physical knowledge so that no possibilities of development would be overlooked. The first step was the establishment of requirements for all types of missiles necessary for the defense of the nation. Study contracts, some competitive, were let to private industry to insure the best methods of approach and to obtain the services of the most capable scientists and development engineers available.

As a result of these studies, it has been determined that military characteristics should be developed for four types of guided missiles:

1. *Air-to-air* for the protection of bomber forces and for use by fighters engaged in combating invading air forces. When perfected, they will be guided to their targets automatically and will have a range that is much greater than that of present day fighter and bomber armament.

ANOTHER BOMBER in the "light" class is Martin's XB-48. It is powered by six J-35 jet engines; speed—over 500 mph



2. *Surface-to-air* for use against invading air forces and ultimately against enemy missiles. They will vastly improve the present air defenses of the United States.

3. *Air-to-surface* for the purpose of increasing the effectiveness of our present bomber striking forces. They will be remotely-controlled from launching aircraft and will have the advantage of enabling bomber forces to attack enemy targets from outside the defended area with greater accuracy.

4. *Surface-to-surface* for use in both the short-range tactical and long-range strategic categories. It was determined at the outset of the program that special emphasis should be given to the development of a supersonic, surface-to-surface missile capable of carrying an atomic warhead 5,000 miles. Since there is no existing defense against this type of weapon, it is essential that the United States be the first nation to develop it.

One of the first Air Force efforts in the guided missiles program was directed toward the development of adequate experimental testing facilities. On V-J Day the Air Force testing range was at Wendover Air Force Base, Utah. When subsequent needs for a larger range could not be met there, test facilities were moved to Holloman Air Force Base near Alamogordo, New Mexico. Facilities at this base are steadily being improved in conjunction with development of the Army Ordnance Department's proving ground at White Sands, New Mexico.

In January, 1946, the First Experimental Guided Missiles Group was activated at the Air Proving Ground, Eglin Air Force Base, Florida. Shortly after its establishment this group participated in the Operation Crossroads atomic bomb tests at Bikini Atoll in the Pacific in the summer of 1946. During both the "Able" and "Baker" tests they guided four unmanned B-17 Flying Fortresses by remote control through the radioactive clouds produced by the two bombs and recorded data unobtainable by other means.

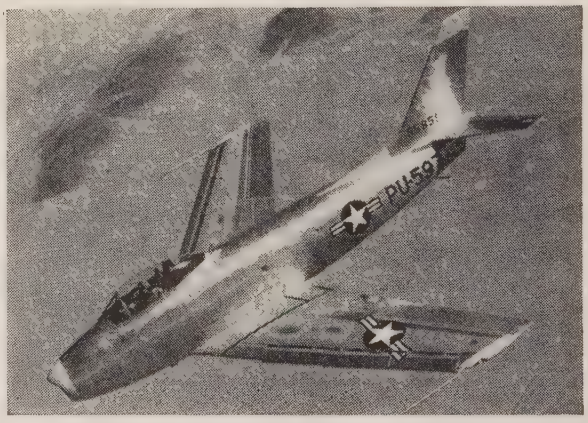
This use of "drone" aircraft gave the Air Force intensive experience in the remote control of crewless aircraft. The drones, equipped with television and controlled by radio from mother planes from distances of as much as eight miles, were all successfully flown. Since then, mother planes have guided crewless aircraft from distances of 25 miles, and control from a distance of 75 to 100 miles is believed to be within present capabilities.

Upon completion of the tests the Group demonstrated the feasibility of long-range, radio-controlled operation of aircraft by guiding two unmanned B-17's from Hawaii to California in "Operation Remote," a forerunner of accurate employment of long-range guided missiles. A milestone in the development of air-war techniques was marked during this flight when a bomb was dropped from one of the crewless planes by remote control.

The Experimental Guided Missiles Group has gained valuable operational experience in the firing of JB-2 missiles from B-17 aircraft and from both permanent and mobile launchers on the ground. The Group is also active in the development of standard procedures for operations with high-angle controllable bombs and carried out Arctic tests with such equipment during the 1946-1947 season in Alaska.

Aircraft and Missile Propulsion

The Air Force Record in the development of the various means of aircraft propulsion, together with its future objectives, is summarized below.



AIR FORCE'S first sweptback fighter plane was F-86. This is fighter that is said to have exceeded speed of sound

Jet propulsion: The various jet propulsion systems have been classified as follows: turbo-jet, turbo-prop, ducted fan, ramjet, and pulse jet. Each of these types is being carefully studied and developed to exploit fully its particular characteristics for use in advanced types of aircraft.

The turbo-jet engine has received the greatest emphasis to date. Two distinct models, the J-33 and the J-35, have become operational, and while the performance and durability of these production-type engines is being steadily improved, a number of more powerful turbo-jet models are being developed.

The gas turbine equipped with a propeller, called the turbo-prop engine, promises greatly increased efficiency for long-range bombardment aircraft capable of carrying heavy loads at speeds in the subsonic region. Although similar in many respects to the turbo-jet, the turbo-

rop engine will require further investigation nd development before it is ready for operaonal use.

To take full advantage of the versatile charcteristics of the propeller in combination with ne jet engine as a means of propulsion, the Air orce is now obtaining propeller research and esign data on high-speed aircraft. Special atention is being given to the problem of deigning new blades, such as the swept-back proeller, to accommodate supersonic speeds at the p and subsonic speeds near the hub.

At present the ramjet appears to be the power lant for supersonic flight and particularly for issile application where rocket propulsion curently affords but limited range. Excellent progess is being made in ramjet development with- the limit of the test facilities available. Its otentiality is indicated by comparing a ramjet ngine 40 inches in diameter with a reciprocatng engine of the same diameter. At 400 miles er hour each has an output of about 2,000 orsepower, but in supersonic flight near sea evel the ramjet engine could deliver up to 110,-00 horsepower, while the reciprocating engine ould still deliver only 2,000 horsepower at any peed.

A special form of the ramjet known as the ulse jet has also been developed. It appears to ave better performance than the ordinary ramt up to a speed of 400 miles per hour. Its use n target aircraft for gunnery practice and in ombination with other forms of propulsion for ircraft is now being explored.

Rocket engines: Progress has been made and uch more is in prospect in the development of ocket engines using solid or liquid propellants. lthough the operational use of rockets for assting the take-off of fighter aircraft and turbot bombers is still very costly, effort is being ade to reduce the expense.

The application of rocket engines to increase ne ceilings of fighter aircraft and to accelerate rough the transonic region shows promise. Of ill greater importance is the application of rge rockets as boosters and main power plants r guided missiles.

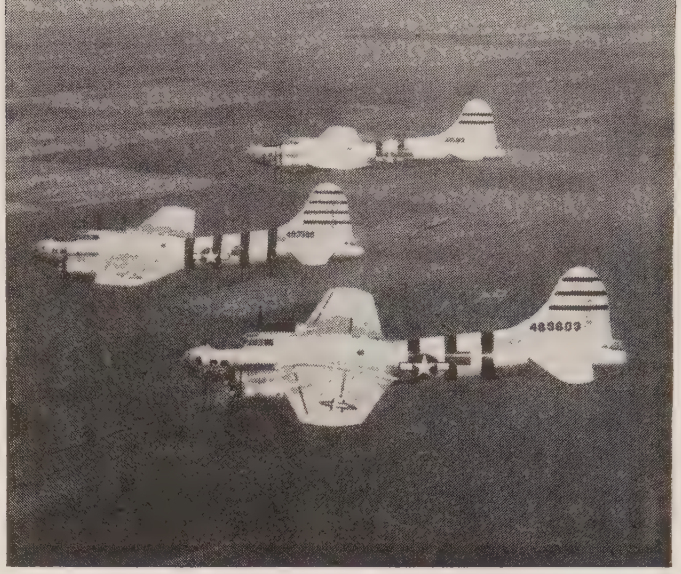
Reciprocating engines: The reciprocating enine remains more economical than any other rm of aircraft propulsion, and at speeds below 0 miles per hour the propeller has a higher ropulsive efficiency than the jet, plus a greater exibility of operation. There is no doubt that eciprocating engines with propellers will conue to be used in large quantities for some me to come in cargo airplanes and trainers.

lectronics

Electronics: Since V-J Day much progress in research and development has been made in electronics, and many wartime developments have been revealed for the first time. The general fields in which this progress has been made are the following:

Airborne radar: A high-precision airborne radar system now available for operational use provides a means of precision navigation and accurate bombing through overcast. Also under development are airborne gunlaying and air ranging equipments to cope with aerial gunnery problems of combat at high speeds and altitudes and against even smaller targets and at greater ranges than before. By means of this equipment accurate range and position information enable fire to be directed upon enemy aircraft and ground targets invisible by direct vision.

Ground radar: Ground radar was first extensively used in England at the beginning of the war to warn of the approach of the *Luftwaffe.*



FLOWN by remote control, these three crewless B-17's made a record-breaking flight from Hawaii to California

STRATOJET bomber is powered by six jet engines, but has 18 JATO units to provide extra power for take-offs

This early equipment employed relatively long wave lengths that provided accurate range but only crude direction and elevation. As a result, while the distance of the attacking formation could be closely determined, only approximate data on the number of aircraft involved could be obtained.

Intense development work initiated during the war produced equipment operating in the microwave region. At this short wave length it became possible to distinguish individual aircraft flying only one mile apart. Microwave equipment also enabled the detection of low-flying planes as far away as the visual horizon and removed a serious flaw of the earlier long-wave equipment.

During the war the Plan Position Indicator, which revealed all targets within a circle centering on the radar station and with radius extended to maximum range, made its debut. The operator was able to observe at one time all radar targets in his vicinity and to select particular targets of interest.

With the introduction of microwave frequencies and the PPI, the role of ground radar increased. Night fighter aircraft could be directed close enough to enemy bombers to enable their airborne radar to take over and make final interception; day fighters could be directed into position to intercept approaching bombers; and escort fighters could be directed to their rendezvous with friendly bombers.

Tracking ground radars which could "lock on" to an enemy airplane and follow its motion automatically were synchronized with anti-aircraft guns, so that the guns bore continuously on their target until it was within range. The same tracking radar was adapted to an important use in the close air support of ground troops. With it a friendly plane could be put precisely over a designated ground target.

Since V-J Day development has been concentrated on extending the range and coverage of ground radar and on the elimination of the human element in the detection and interception of enemy aircraft and missiles.

Navigation aids: During the past two years Air Force development of electronic navigation and traffic-control systems for aircraft has been greatly intensified in coordination with both civil and other military agencies. A number of experimental systems have been developed by the Air Force, and tests to evaluate them are now under way or about to start. An agreement has been reached as to the operational requirements for a short-distance navigation and traffic-control system applicable to military as well as to all civil aircraft. Quantity procurement is starting on the first items for this system.

Television: Lightweight airborne television equipment developed by the Air Force can be installed in a remotely-controlled crewless aircraft to transmit instantaneous visual pictures of the control panel and of the view ahead to the guiding or "mother" aircraft. Other late trends include the development of miniature television equipment for use where size and weight limitations preclude the use of standard devices.

Remote guidance and control: A signal event occurred in this field when in September, 1947, a Douglas C-54 *Skymaster* with an electro-mechanical "brain," took off at the push of a button from Stephenville, Newfoundland, flew along across the Atlantic some 2,400 miles, and landed at Brize Norton airfield near London approximately 10 hours later. No mother aircraft was used, and although Air Force crewmen and observers were aboard the unique plane, not once was it necessary for any of them to take over a control or to correct in any way the electro-mechanically controlled course. Two ships in the Atlantic transmitted the necessary bearing beams to keep the *Skymaster* on its course. A beam at the end of the English airfield turned it into the glide path and lowered the landing gear. Shortly after the wheels touched the runway the *Skymaster* braked itself to a stop.

Armament

The Air Force is conducting active research and development programs in regard to armament in cooperation with the Army Ordnance Department, which has primary responsibility in this field. Although improvements have lagged in comparison with the rapid progress made in connection with airframes and engines, special emphasis is being given to studies designed to bring Air Force armament abreast of developments in other areas of activity. A system of gun-laying radar is being utilized, for example, which makes efficient gunnery feasible at present-day speeds, and new types of rocket weapons to be fired from an airplane and detonated by proximity fuse in the vicinity of the target are being developed. Since it appears possible that at some time in the future the speed of aircraft may equal or exceed the normal speed of gun-fired projectiles, basic research is being pursued in connection with projectile ballistics.

Winterization

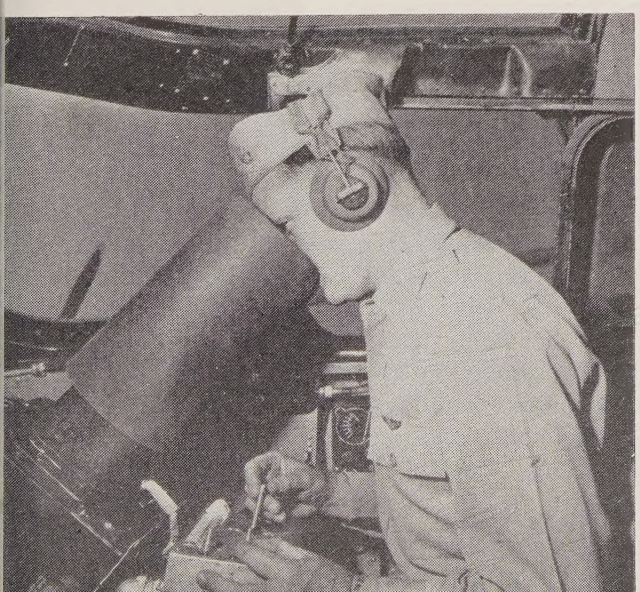
As a future war will likely establish a vastly increased requirement for air operations under Arctic conditions, the Air Force is devoting special attention to development of the techniques, methods, and equipment required for efficient

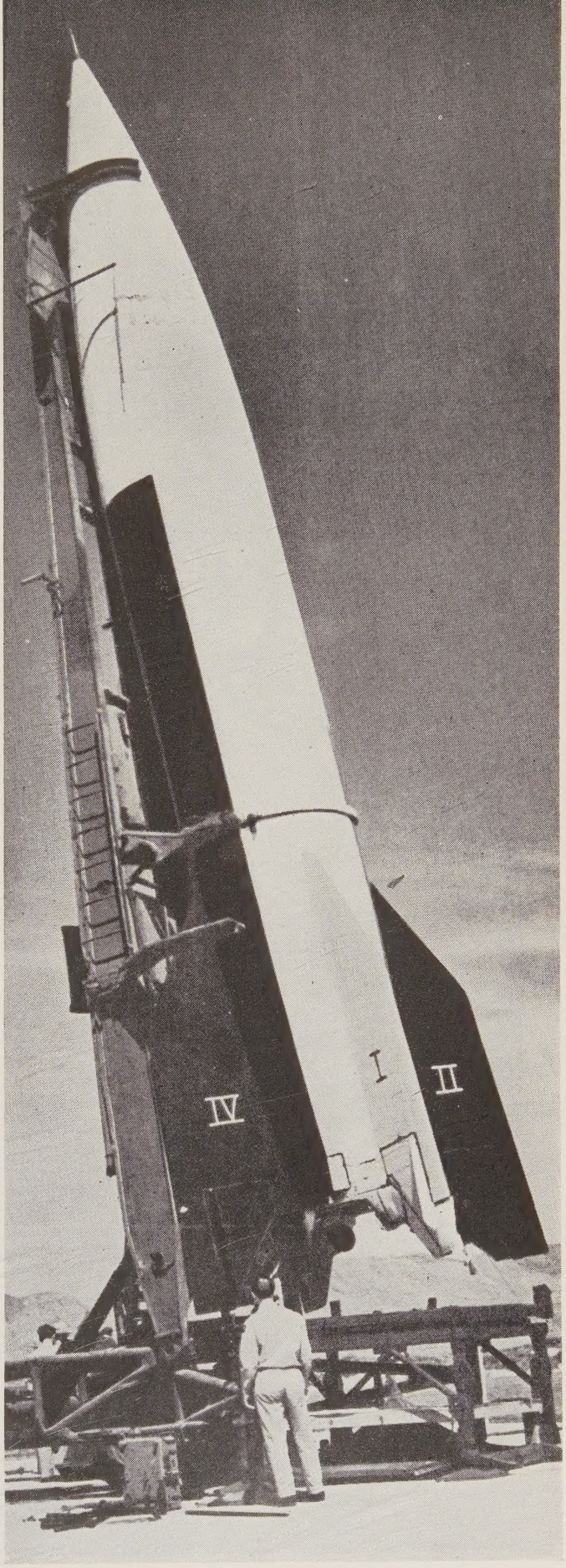
operations under cold-weather flying conditions.

The major problem is the preparation of aircraft and equipment for proper employment in extreme cold, which seriously complicates operation and maintenance. Plexiglas windshields and astrodomes, for instance, frequently crack when moved abruptly from warm hangars to the icy outside. Standard lubricants solidify. Batteries rapidly lose their charge unless moved to warm interiors. Rubber fuel hoses, made brittle by the cold, shatter when dropped on hard frozen surfaces. Tires freeze to runways unless specially protected. Ice and snow accumulate in control mechanisms. Standard instruments become unreliable. Engines must be preheated before starting. Very low temperatures also severely limit the efficiency of flight and ground crew personnel. Protective garments must be worn almost constantly, and time and energy must be devoted to the problems of personal survival.

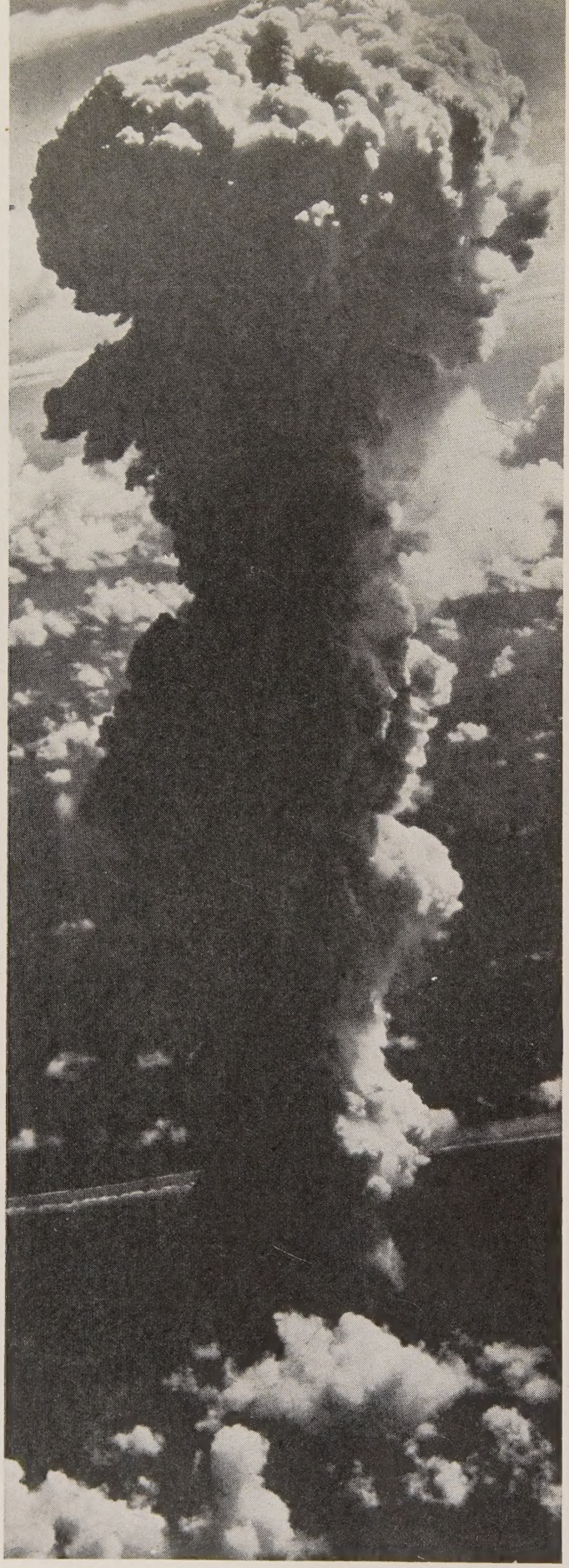
To overcome the obstacles of Arctic operation, Air Force units in Alaska are conducting experimental and test programs with wing and propeller de-icing, cold-engine starting, cabin and cockpit heating, cold-weather maintenance, and low-temperature lubrication. Other objectives include the development of high volatility fuels, towing equipment of sufficient power and traction to pull heavy aircraft through snow and ice, auxiliary starting equipment powerful enough to accomplish rapid engine turnovers at low temperatures, more efficient protective clothing, and a wide variety of freeze-resistance servicing units. The facilities of the Climatic Hangar at Eglin Air Force Base, Florida, are also being extensively used the year round. In the Climatic Hangar, completed in April, 1947, the varied conditions and temperature ranges encountered in any part of the world can be

TELEVISION screen gives this "beeper pilot" a bomb's-eye view of target. He then remote controls bomb to X spot





RESEARCH ROCKETS are equipped with instruments for analyzing flight into stratosphere. Instruments are chuted down



ATOM BOMB TESTS have been made several times since the first atomic bomb was dropped on Japan in World War II

duplicated. It has made possible a great saving in the field of cold-weather research and development.

Atomic Energy

Within the structure of the National Military Establishment there has been established the Armed Forces Special Weapons Project to serve military departments concerned with atomic energy. With the Air Force remains the responsibility for developing its ability to us the new weapon in support of its mission.

Atomic energy is of extreme importance in Air Force planning. Wartime experience with the atomic bomb did not provide opportunity for clinical observation and analysis of the real nature of the weapon. Tests were therefore conducted in the Pacific Ocean, at Bikini Atoll, in the summer of 1946 which have provided much data of great value to the armed forces and have defined new problems to be solved. The Air Force is participating in further research and in the tests being carried on at the Atomic Energy Commission Proving Ground, Eniwetok Atoll, Marshall Islands. In collaboration with the aircraft industry and the Atomic Energy Commission, the Air Force is also sponsoring an extensive research program attacking the problem of applying nuclear energy to the propulsion of aircraft.

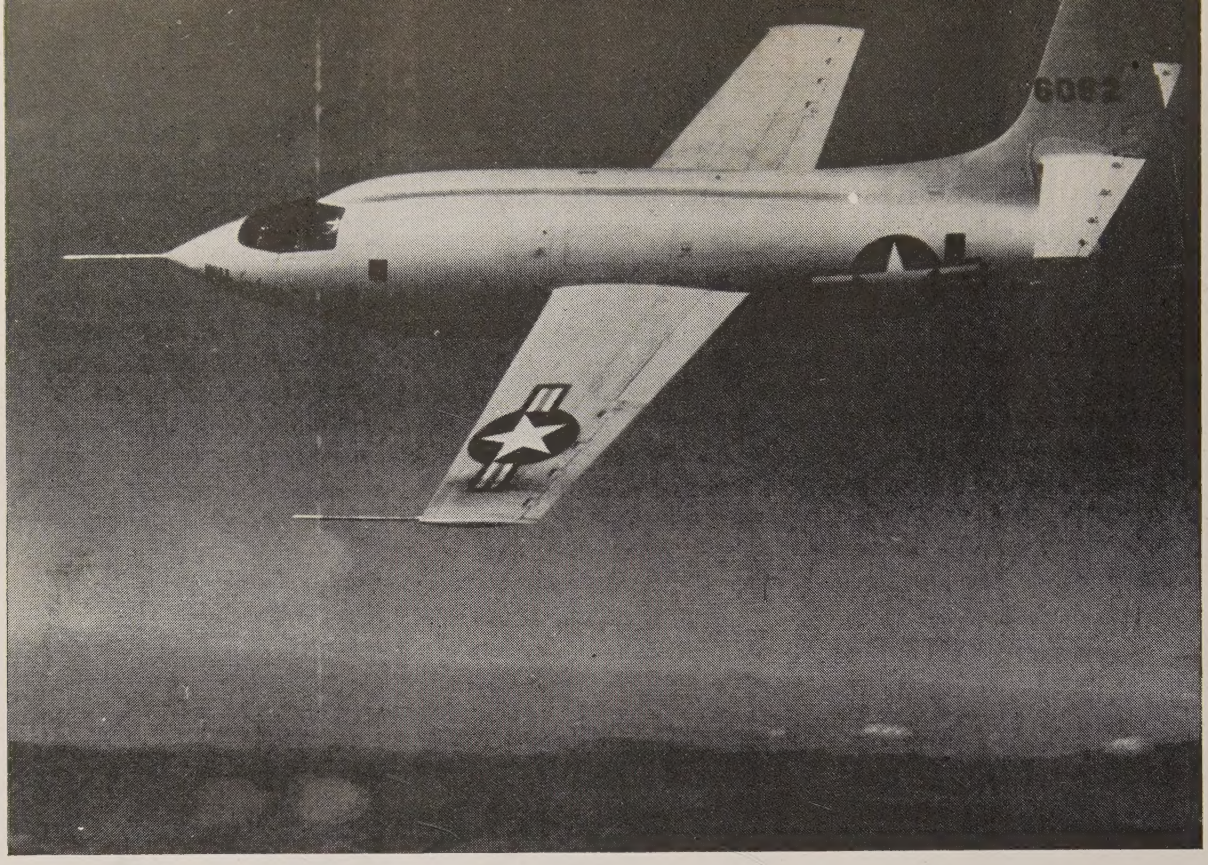
The extensive research and development required to convert atomic energy into useful energy for other than military purposes is being undertaken by the Atomic Energy Commission.

Conclusion

From the post-demobilization low point (303,614 military personnel, May 31, 1947, in contrast to 2,314,000 on V-E Day, 1945) much progress has been made by the Air Force toward attaining a force-in-being effective enough to enable it to carry out its peacetime mission. Military efficiency is at best intangible. The efficiency of the Air Force and its meaningful expression are standing matters of concern. Furthermore, by efficiency in wartime, when the attacks of an enemy are being resisted and the battle is being carried to him, we must inevitably mean something other than the efficiency implied in the combat readiness that is our peacetime mission. The stimulus of patriotism and the incentives of combat must always be reflected in the efficiency of a fighting unit, whether their effect may be measured or not. But the Air Force today is carefully building a force-in-being that is within the limitations of appropriated funds.

The reorganization of the Air Force, the

INDUSTRIAL PLANNING can shorten materially the time lapse between a possible M-day and the achievement of maximum production of war materiel. A prepared industry is essential to ultimate victory. This chart, prepared by the Air Force, graphically shows the time that was required by industry to become geared to maximum production in World War II; the time that would be necessary today, and the time that would be required according to recommendations of the Congressional Aviation Policy Board. This chart pertains to airframe production only



THE X-1 is one of four rocket-powered supersonic speed ships. This one has exceeded speed of sound many times

achievement of autonomy within a unified defense structure, and the successful accomplishment of the 55-Group Phase of the 70-Group Program were all major steps toward the attainment of efficient air power for the Nation's defense. But the fullest attainment of that air power will be the establishment of an Air-Force-in-Being capable of replying to any aggression with a quick, crushing counter air attack.

To be capable of such decisive action the Air Force must continue to have weapons of the highest quality. Thus in large part American air power rests upon the ability of American scientists to provide the designs from which a healthy aviation industry can produce a continuing flow of constantly improved weapons and aircraft. The immediate urgency of this activity becomes apparent when we realize that a time lag of years separates the blueprint from the final production model of any aerial weapon. The B-29 Superfortress, for example, which delivered the atomic bomb at Hiroshima and Nagasaki, was first designed in 1936, was placed in production in 1943 and did not enter active combat service in even limited quantities until 1944. The fact that a United States Air Force plane, the Bell X-1, flown by United States Air Force pilots, has broken through the sonic barrier to fly faster than the speed of sound is dramatic evidence that experiments are carrying us still farther toward the conquest of the air. But the developmental process whereby such experimental aircraft are forged into fighting counterparts is a formidable one that will tax the ingenuity of our scientists and the resources of our industry.

Air power cannot be built out of nothing, no matter how skillfully and diligently the military airman applies himself. Air power is, instead, the end product of a tremendous amount of activity in thousands of related educational, industrial, scientific, governmental, and economic fields. It can be given impetus by an awareness on the part of each United States citizen of its predominant importance in the age in which we are now living.

What the Air Force is doing to translate the resources of our country and of our people into effective air power has been the subject of this report. It is a complex and, we believe, not unimpressive record. But no matter how intensive the efforts of Air Force personnel, American air power will never be greater than the elements of which it is composed—and never stronger than the energy and imagination that every American citizen contributes to it.

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